

APRIL, 1949

The Review of Gastroenterology

OFFICIAL



PUBLICATION

NATIONAL GASTROENTEROLOGICAL ASSOCIATION

Palliative Operations for Gastric Cancer

Carcinoma of the Thoracic Esophagus

Peptic Ulcer: Theory and Practice

Foreign Bodies in the Stomach

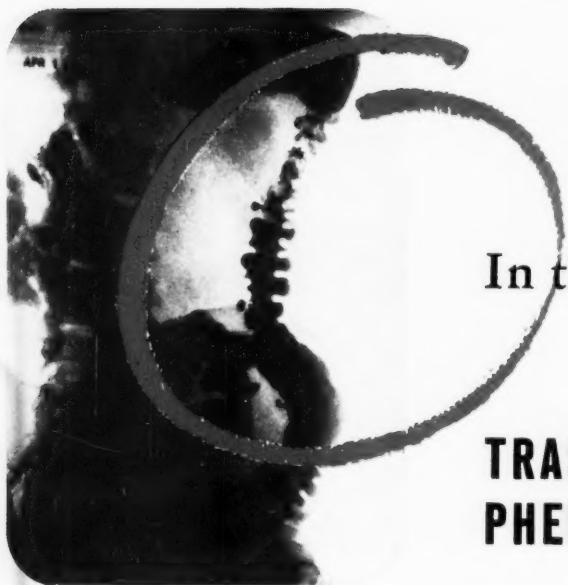


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*The Pioneer Journal of Gastroenterology, Proctology and Allied Subjects
in the United States and Canada*

VOLUME 16

APRIL, 1949

NUMBER 4

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of the

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1819 Broadway, New York 23, N. Y.

Editorial Office, 146 Central Park West, New York 23, N. Y.

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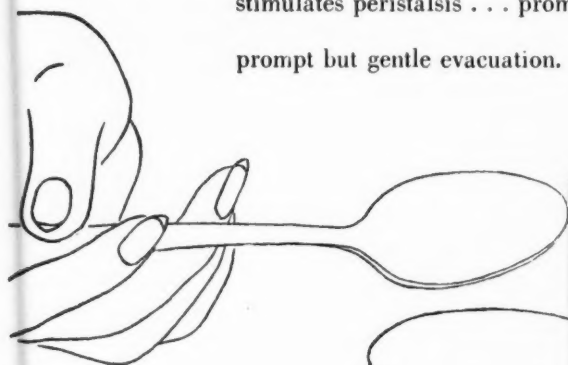
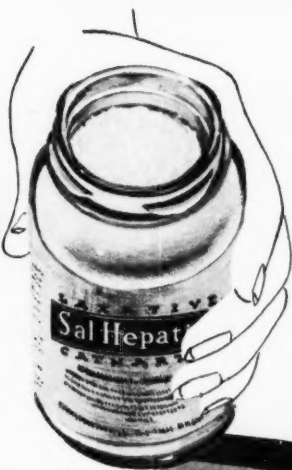
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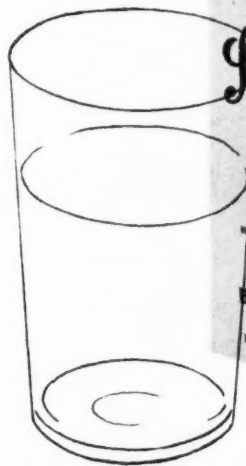


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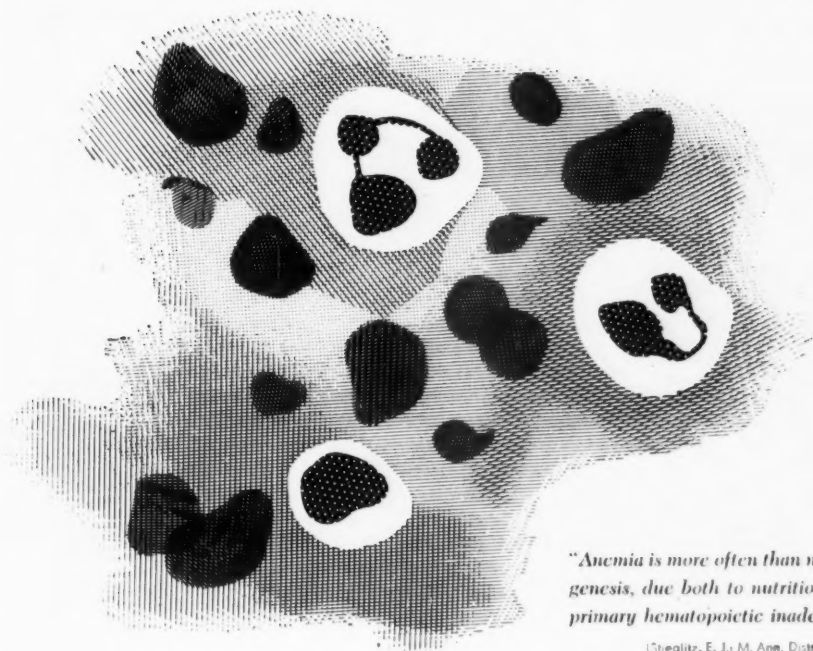
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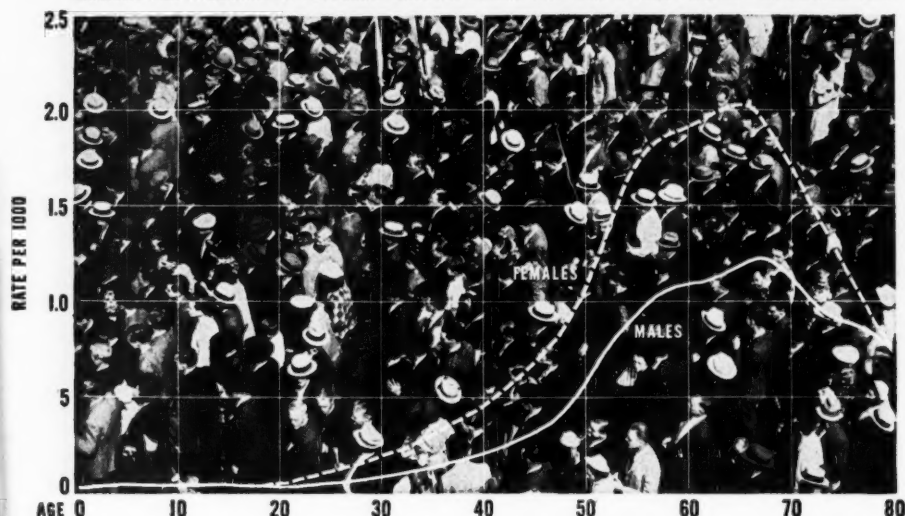
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PALLIATIVE OPERATIONS FOR GASTRIC CANCER*†

GEORGE T. PACK, M.D.

and

GORDON McNEER, M.D.

New York, N. Y.

GENERAL CONSIDERATIONS

The treatment of cancer of the stomach may best be defined as a philosophy, rather than as a technic. If the surgeon's point of view be pessimistic and conservative, if he seeks reasons opposing radical surgical management of gastric cancer, he will find many statisticians and clinicians who will support his view. It is our opinion, however, that if his philosophy does not urge the attempted removal of every gastric cancer brought before him he should not treat this disease. Contradictions against resection of stomach cancers become fewer as we gain in operative and clinical experience. The surgeon must be prepared to resect any part or all of the stomach, by the transabdominal or thoracic route, including adjacent organs in the dissection whenever locally infiltrated by cancer. Even when distant metastases are indisputably demonstrable, resection offers the only true palliation. Although at the present time such operations may be considered ultra-radical, we are convinced of their value. No one who has opened and immediately closed an abdomen after the discovery of an inoperable cancer can forget the sense of despair and futility which invades him, the patient and his relatives, in contradistinction to the hope which is born whenever the growth has been resected. Although at present there is a justifiable distinction between subtotal and total gastrectomy and resection of the gastric cardia, transabdominal, thoracic or combined incisions, these operations will ultimately be considered only as alternative methods of surgical treatment and will not be distinguished with respect to operability and end-results. The more extensive resections are being conducted routinely, the technics are now standardized and mortality rates are fairly comparable. Hence if the cancer is locally resectable, we now advocate resection regardless of the location of the neoplasm in the stomach.

*Especially submitted for publication during the 15th Anniversary Year of the National Gastroenterological Association and the 15th Year of publication of the Review of Gastroenterology, 1948-1949.

†From the Gastric Service of the Memorial Hospital, New York, N. Y.

This philosophy must be tempered by judgment and previous experience. Quite obviously the presence of ascites denoting metastases to the peritoneum, mesentery or omentum is still a contraindication to resection; numerous studs throughout the intestine, debilitating distant metastases to bone, cerebrum, lungs, etc., are factors predisposing to an early unfavorable outcome regardless of any form of treatment.

DEFINITION OF PALLIATION IN GASTRIC CANCER

What does palliation mean to the average physician and patient? Does it mean the mere prolongation of life? Is it for the purpose of allowing the patient to live and suffer a little longer? In our opinion palliative surgery is that type of procedure which permits the patient to live out his life more comfortably. It must

TABLE I
PERCENTAGE OF RESECTIONS AND PALLIATIVE OPERATIONS FOR GASTRIC CANCER
Memorial Hospital, New York, 1916 through 1946

Period	Number of Operations	Resections		Palliative Operations	
		Number	Per cent	Number	Per cent
Total	543	261	48.1	282	51.9
1916 through 1930 . . .	90	8	8.9	82	91.9
1931 through 1936 . . .	77	19	24.7	58	75.3
1937 through 1941 . . .	139	73	52.5	66	47.5
1942 through 1946 . . .	237	161	67.9	76	32.1

relieve his symptoms, if they be nausea, vomiting, pain, starvation or dysphagia, in such a way as to permit of comfort. If for a certain individual the mere prolongation of life is important, then an operative procedure devised toward feeding through a fistula, either gastric or jejunal, is advisable. We recall a patient suffering from esophageal cancer who could swallow only clear liquids; he therefore chose alcohol as his chief source of nourishment and in due course of time died most happily. Unfortunately many patients, formerly frequent habitual users of whiskey, lose a taste for this nectar when cancer involves the stomach.

There is no palliation afforded comparable to that obtained by removal of the primary gastric tumor. When this is not possible, exclusion of the lesion from the ingesta is preferable to gastroenterostomy. When neither can be performed the last resort is gastrostomy or jejunostomy for feeding purposes.

A true concept of palliation is gained only after a critical observation of patients who have undergone the so-called palliative operations. In spite of the benefits of gastroenterostomy, as described by Howard Gray³⁵, we do not consider

the relief afforded by this operation as of significantly great value. For a while at least these patients are relieved of pyloric obstruction, but in our experience most of them continued to have fetid breath and abdominal discomfort. If the tumor is left in situ the only other procedure offering palliation is that of pyloric exclusion, originally described by von Eiselsberg²². As for gastrostomy and jejunostomy we would recommend such operations only for feeding purposes. Very few persons actually enjoy a future governed by feedings of this sort, unless convinced by the surgeon that they are only temporary. Purely palliative operations for bypassing or feeding purposes are avoided unless resection is completely out of the question.

When the ratio of nonresected and resected cases is charted to show the proportion of palliative operations vs. resections throughout the years, a dramatic

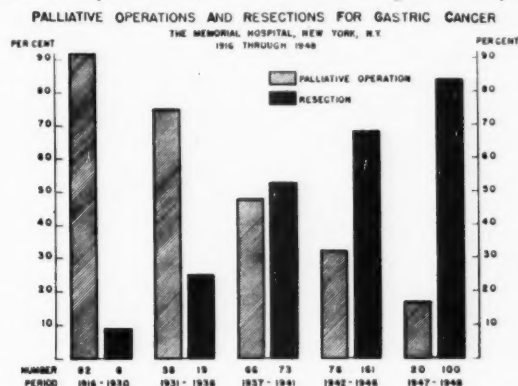


Fig. 1

Fig. 1—Distribution of Palliative Operations and Resections for Gastric Cancer, The Memorial Hospital, New York, N. Y., 1916 through 1948.

change is observed at the Memorial Hospital. For in the period 1937 through 1941 the number of resections exceeded the number of palliative operations. It is interesting to note that with the totals for the four periods, there is almost equal distribution between the resections and the palliative operations. When this is broken down into the four periods, the percentage of resections increases from 8.9 in the early period to 67.9, with a corresponding decline in the percentage of palliative operations (Table I, Figure 1). For the years 1947 and 1948 the percentage of resections is much higher.

PALLIATIVE GASTRECTOMY

The superiority of resection over all operative technics short of removal of the neoplasm as applied to the palliative management of gastric cancer cannot be denied. Because one may have been mistaken by the gross appearance of the lesion and adjacent lymph nodes, not infrequently such patients are thereby cured of their cancer. In earlier years we had considered the removal of gastric cancers fixed to adjacent organs, as a measure purely of palliation or of desperation, only

to find that a number of these patients lived for over five years without recurrence or metastasis. Extension of the cancer through the serosa therefore is not necessarily a definite proof of unfavorable prognosis. The removal en bloc of a greater extent of apparently healthy tissue is obviously a better operation and the apparent palliative procedure becomes curative. Hence if resection is at all possible, the patient should not be denied the opportunity. Gray has pointed out the additional fact that a slight ray of hope is thereby granted the patient's relatives.

But temporarily at least, the patient who survives resection receives the greatest benefit, for he can eat and enjoy his food once more. To all people this is important, but to the elderly, many of whom are no longer actively engaged in work or business, this is a boon indeed. He now enjoys the taste of food particularly of meat which so often cannot be digested by cancerous stomachs. Nausea, vomiting, dysphagia and even pain are no longer daily experiences. The weakness and even dyspnea produced by anemia have disappeared. No more sour eructations and belching of foul-tasting gas occur. The bowels move daily as a normal intake of food and water is preserved. In a word, no more grateful patient exists than the one who may eat and enjoy good food again. Gain in weight is encouraging to the patient and his family.

The practice of telling patients of the hopeless nature of their disease is strongly to be condemned, yet we would wager that if each were informed of the situation, almost invariably he would select resection to any other palliative procedure despite the increased operative mortality. Occasionally one is asked by relatives to "keep Father alive a little longer at all costs", by some short-circuiting or type of operation designed for feeding. Unless he or she has certain business to attend, this mere prolongation of life often seems unfair to the one person it is designed to help.

One is frequently confronted with the argument that because of the high operative mortality, the danger to the patient is unwarranted for the value received. That individual must be asked: What is the danger from nonresected gastric cancer? The operative mortality is not so high if the operation is well conceived and executed; and if proper attention to the details of pre- and post-operative care is employed.

Extent of Resection:—Removal of the omentum hardly seems advisable in the presence of proven metastases to liver, cervical lymph nodes or cul de sac. On the other hand, if one is resecting gastric cancers in continuity with other organs, the omentum should be included in the dissection. If one be guided by the philosophy and not the technic of gastric operations, the extent of the procedure is of secondary importance. Formerly we performed only partial or subtotal gastrectomy for palliative purposes. Now that the operative mortality rates for total gastrectomy and resection of the gastric cardia are little more than for subtotal gastrectomy, we no longer hesitate to advocate the removal of the cancer under any circumstance or by any technic which affords a fair chance of survival

TABLE II
OPERATIVE MORTALITY FOLLOWING PALLIATIVE OPERATIONS FOR GASTRIC CANCER
Memorial Hospital, New York, 1916 through 1946

Type of Palliative Operation	Total Cases			1916 through 1930			1931 through 1936			1937 through 1941			1942 through 1946		
	Total Cases	Operative Deaths		Total Cases	Operative Deaths		Total Cases	Operative Deaths		Total Cases	Operative Deaths		Total Cases	Operative Deaths	
		Number	Per cent		Number	Per cent		Number	Per cent		Number	Per cent		Number	Per cent
All palliative operations.....	272	61	22.4	72	26	36.1	58	6	10.3	66	11	16.7	76	18	23.7
Gastrostomy.....	104	11	10.6	17	9	42.9	26	0	0.	36	1	2.8	25	1	4.0
Gastroenterostomy...	73	19	26.0	43	12	27.9	15	3	20.0	7	2	28.6	8	2	25.0
Gastroenterostomy with pyloric exclusion	12	5	41.7	0	0	0.	2	0	0.	5	3	60.0	5	2	40.0
Jejunostomy.....	67	23	34.3	12	5	41.7	15	3	20.0	16	5	31.3	24	10	41.7
Palliative gastrectomy	16	3	18.8	0	0	0.	0	0	0.	2	0	0.	14	3	21.4

with restoration of gastro- or esophagointestinal continuity. The removal of intra-abdominal metastatic deposits or of hepatic metastases does *not* seem justified in our opinion, denoting lack of knowledge of the natural history of cancer of the stomach. On the other hand, total ablation of a stomach completely obstructed or replaced by cancer may offer many months of comfort to the patient. Present day anastomotic technics are less frequently accompanied by stricture and whereas gain in weight is infrequent, enjoyment and normal intake of food is quite common.

Results of Palliative Gastrectomy:—Of 16 such operations performed at the Memorial Hospital between 1937 and 1946 there were three operative deaths, or a hospital mortality of 18.8 per cent; except for gastrostomy much the lowest for all palliative operations. The percentage of operative deaths would naturally be higher than for curative resections, because of the more advanced stage of the incurable cancers which are resected and because the patients are in consequence not as good surgical risks. This operative mortality is relatively low and in almost all instances a sense of well-being is restored until shortly before death. The postoperative duration of life averaged 8.4 months in this series of patients, as best representing palliation in the true sense of the word. A number of other case histories were not included, because although representing palliation, an apparent cure of five-year survival was obtained. Such reports would distort the figures and detract from the meaning of the term—palliation.

PALLIATIVE GASTROENTEROSTOMY FOR CANCER

It is difficult to write with optimistic conviction about an operation which is employed with ever decreasing frequency from year to year. Under such circumstances as prevent resection, gastroenterostomy with exclusion or occlusion of the distal segment is advocated whenever possible.

At the Memorial Hospital, 73 gastroenterostomies have been performed for cancer of the stomach during the years 1916-1946, as shown in Table II. The average postoperative duration of life was 7.7 months, based upon 54 patients who survived the operation. The operative mortality was 26.0 per cent.

The number of gastrectomies for cancer has increased with each succeeding year but at the Memorial Hospital, only 15 gastroenterostomies were performed over the ten-year period 1937-1946. Another point of interest is that the average survival period was only 6.0 months for the eleven patients who survived the operation, indicating that these few received palliation for only a short time.

If one studies the combined efforts of Billroth⁹, von Hacker³⁶, von Eiselsberg²⁴, Schönbauer and Orator⁶⁸, von Rydygier⁶⁶, Goldschwend³⁴, Hartmann⁴⁰, Ringel⁶³, Stich⁷⁶, Altschul¹, Brunner¹², Anschutz², of 983 gastroenterostomies for cancer, not one patient lived for three years after the operation. On the other hand, Daneel's experience¹⁷ (203 cases of gastroenterostomy) was rewarded with seven three-year and two five-year survivors. Several possibilities come to mind. The operation in such instances might have been performed for ulcerocancer which, until metastasis has occurred, is slow in genesis and progress.

It is entirely possible that until gastric resection came to be the standard operation for the management of this cancer, gastroenterostomy was performed on many occasions for lesions which would now be surgically extirpated. Hence the cancer had not reached the advanced stage which would obtain were the operation to be applied nowadays. As an explanation for some of the reported long-term survivals following simple gastrectomy, it is entirely possible that an occasional gastroenterostomy was unwittingly performed for peptic ulceration rather than for carcinoma. This is particularly pertinent when we recall the case of J. M. The preoperative history suggested gastric cancer. A gastric analysis revealed achlorhydria after histamine stimulation. The radiologist definitely diagnosed the lesion as carcinomatous. At laparotomy an enormous ulceration was found to involve the proximal posterolateral gastric wall, invading the spleen, tail of the pancreas, diaphragm and liver. A resection of the proximal gastric segment, spleen, tail and body of the pancreas, adjacent diaphragm and part of the left lobe of the liver was carried out successfully. The gross surgical pathological diagnosis was carcinoma, but microscopic examination of serially cut sections demonstrated benign peptic ulceration. Had such an ulceration infiltrated the head of the pancreas, it is entirely possible that until very recent years, a simple gastroenterostomy would have been performed, resulting in an apparent five-year survival of a patient with a supposed gastric cancer by a side-tracking operation.

Choice of Procedure:—Gastroenterostomy might be indicated if the gastric cancer invades the head of the pancreas and has metastasized to the liver or cul de sac, or other distant organs without compromising the success of the operative procedure contemplated. Exclusion of the distal segment cannot be successfully effected because of cancerous metastases to the lymph nodes of the lesser curvature or to involvement of one of the gastric walls. The surgeon therefore elects to perform gastroenterostomy. The only decision required is, therefore, whether it be constructed anterior or posterior to the transverse colon. As a general rule, an anterior or antecolic anastomosis is preferred, because it is simpler, invasion of the anterior gastric wall by cancer is less frequent, and the possibility of gastrojejuno-colic fistula is obviated.

Anesthesia:—Intratracheal gas-oxygen-ether or cyclopropane is the agent of choice. They may frequently be supplemented by intravenous curare. The abandonment of spinal anesthesia has been brought about by the frequent necessity for the application of a laparothoracotomy when not contemplated prior to operation. It has been our experience time and again that radiographically small gastric cancers proved to be larger than anticipated or by their infiltrative or metastasizing characteristics required total gastrectomy. Whereas in many patients this operation may safely and readily be conducted by the abdominal route, frequently the ability to extend the incision into the thorax renders the exposure incomparably superior. Likewise the presence of an intratracheal tube permits of frequent tracheal suction during the operation. The surgeon, moreover, often does not

plan to perform a gastroenterostomy before opening the abdomen. The decision may be made only when laparotomy reveals the inoperability of the cancer.

Anterior Gastroenterostomy:—The abdomen is opened in the usual manner through a left paramedian muscle-retracting incision. When the decision has been made regarding anterior gastroenterostomy, the ligament of Treitz is located and a loop of jejunum brought anterior to the colon in such a manner that the small bowel rests lightly and freely on the transverse colon. If the omentum is heavy, it should be resected, although these patients are frequently so emaciated that this is not necessary. *In our experience it makes absolutely no difference whether the anastomosis is iso- or antiperistaltic.* However, we usually rotate the jejunal limb so that the distal segment of the jejunum lies nearest the pylorus. The jejunum is brought into close apposition with the greater curvature side of the anterior gastric wall, well above the carcinoma. Stabilization of the anastomosis by the placing of fine silk sutures through stomach and jejunum at each end of the anastomotic site is done. A layer of interrupted seromuscular sutures between the two organs is then laid at relatively short intervals, employing fine silk. The small intestine and stomach are then opened, parallel to the line of suture, but just short of its entire length. All bleeding vessels are tied with fine silk. The second or inner layer may be accomplished by interrupted sutures of fine chromic catgut or silk or by a continuous #00 chromic catgut suture. Careful approximation of the mucosal surface of stomach and jejunum is paramount. As the continuous suture passes through the distal end of the second layer of the posterior aspect of the anastomosis, it may be tied or locked; this is to avoid a possible pursestring effect. It is then brought back anteriorly after the method of Connell. A second layer of interrupted sutures of fine silk completes the anastomosis. It is well to re-enforce the ends with one or two mattress sutures of fine silk. If adequate omentum or areolar tissue is available it may be applied loosely about the anastomotic site and sutured in place. The length of the stoma is usually five or six centimeters. The abdomen is closed in layers in the usual manner.

Posterior Gastroenterostomy:—The anastomosis may be constructed posterior to the transverse colon, rather than anterior to or above it. If on occasion it seems more feasible to construct the anastomosis posteriorly because of the location of the gastric cancer, the transverse colon should be brought forcibly out of the wound. The mid-colic vessels are put on a stretch and visibly demonstrated. The avascular mesocolon adjacent to the mid-colic artery and vein is thus exposed, entered and the opening enlarged to admit a loop of small bowel. The anastomosis between stomach and jejunum is then effected in exactly the same manner as described for anterior anastomosis. The edges in the rent in the transverse mesocolon are then sutured to the gastric serosa around the anastomotic site, thus effectually closing the opening, stabilizing the anastomosis and preventing herniation of small bowel into the lesser omental bursa.

This operation is being performed with less and less frequency in connection with gastric cancer. That it has a very limited place in the treatment of this disease

cannot be denied. In our opinion, however, we cannot but agree with the immortal words of Dr. William J. Mayo that gastroenterostomy when employed in the treatment of cancer of the stomach allows the patient "to live and suffer a little longer".

Evisceration, requiring secondary wound closure, occurred on two occasions.

Operative Mortality:—On the basis of 73 patients operated on from 1916-1946 the operative mortality was 26.0 per cent; for 30 patients operated on from 1931-1946 it was 23.3 per cent.

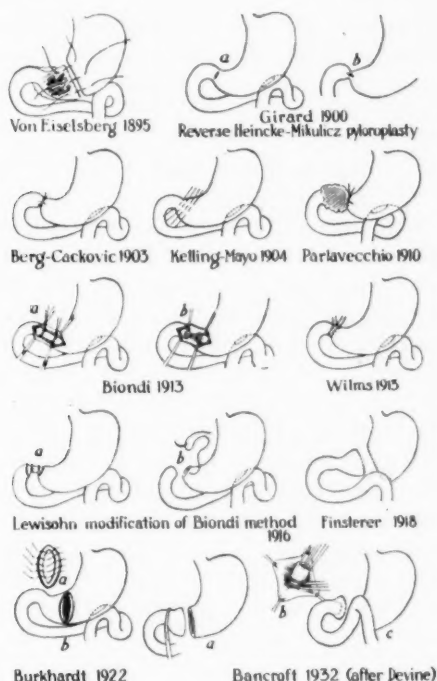


Fig. 2

Fig. 2—Evolution of methods of excluding pylorus for ulcer and carcinoma. The technical details are described in the text.

Postoperative Duration:—Contrary to the experience at the Mayo Clinic, the postoperative duration was only 7.7 months. This is so limited a period that *one would hope every day meant palliation.*

GASTROENTEROSTOMY WITH PYLORIC EXCLUSION OF INOPERABLE CANCER

According to Bickham⁸; "By pyloric occlusion or exclusion is meant the blocking of the pylorus, in order to force food out of the stomach through a gastroenterostomy opening, and divert it from passage through its normal channel, thus

securing functional rest to the occluded part. The basis of this technic is the observation made upon animals, that when gastroenterostomy is performed and the pylorus left open, most of the food continues to leave the stomach by the pylorus." Lewisohn⁵⁰ demonstrated experimentally in dogs that 80 per cent of the ingesta would leave through the pylorus rather than via the gastrojejunostomy stoma.

Gastroenterostomy with exclusion of the cancer-bearing distal segment of the stomach has had application in our hands as a palliative measure for inoperable cancers of the pylorus and antrum⁵⁷. Gastroenterostomy alone had been the previous procedure in these cases, and had been attended by a mortality rate that was as high as for gastric resection and in addition had many other disadvantages which we shall summarize briefly. The symptomatic relief from this operation is not great, as the patients continue to experience some pain, anorexia, nausea and frequent eructation of gas and foul liquid. The food is contaminated by contact with the ulcerated, infected lesion. The tumor is irritated by the food and products of digestion, resulting in continued bleeding and progressive anemia. The carcinoma after gastroenterostomy frequently grows upward to involve and obstruct the stoma, unless a very high anastomosis is done, in which case it is not of great aid in emptying the stomach. Even with a gastroenterostomy, 235 to 250 cc. of fluid introduced into the stomach passed through the unobstructed pylorus, while only 11 cc. passed through the gastroenterostomy stoma. This work was verified by Lewisohn⁵⁰, who derived his opinion from the use of a dye, thionine blue, which has an affinity for mucus. Pyloric obstruction will deflect more of the gastric contents through the gastroenterostomy stoma; nevertheless, the carcinoma in this segment of the stomach continues to be traumatized so long as it remains in the gastrointestinal channel.

The advantages of gastroenterostomy are greatly enhanced by permanent exclusion of the carcinoma of the pylorus, antrum and occasionally pars media, from the uninvolved proximal segment. The first case in which we employed this procedure was an inoperable carcinoma of the first part of the duodenum. Its chief indication is when the carcinoma is so fixed and adherent that partial gastrectomy is not feasible.

The operation we are describing is not to be generally used, but is helpful in indicated cases. Its purpose is to prolong life and to make the patient more comfortable. This operation should have a lower mortality rate than gastroenterostomy alone, as has been proved statistically by several authors, who used various methods of exclusion for gastric and duodenal ulcer. In our own cases, however, the operative mortality has been high. The excluded distal segment of the stomach is put at complete rest, which greatly relieves pain and discomfort. The appetite and digestion improve as soon as the proximal gastric mucosa becomes clean and free from infection. The tumor itself becomes smaller, presumably because of the subsidence of infection and surrounding inflammatory reaction. This is beneficial in three different ways: palliative irradiation is not handicapped by the diminished radiosensitivity of the cancer which infection entails; the rate of growth of the

tumor is no longer increased by the stimulation through infection; the exclusion of digestive ferments renders the danger of autodigestion and perforation of the cancer less imminent. Hemorrhage is then an infrequent complication and the anemia less fulminating. Exclusion of the tumor prevents its extension to involve the new stoma and occasionally the cardia.

Exclusion of the pylorus or distal third of the stomach for gastric and duodenal ulcers has been advocated by innumerable surgeons during the past forty years. We have not attempted to cull a complete bibliography from the literature on this subject but have shown diagrammatically the salient features of these operations in Figure 2. The majority of these authors have applied this operation only in the treatment of peptic ulcers, Parlavecchio⁵⁹ in 1910 being the only one we discovered who used it for carcinoma.

The first operation for exclusion of the pylorus was described by Doyen in 1892 and was accomplished by means of a transverse section of the stomach with blind closure of the ends. Three years later, von Eiselsberg²² described a similar procedure which he advised for the surgical treatment of peptic ulcers in preference to simple gastroenterostomy. His technic will later be described in full. This operation in the hands of its originator required about ninety minutes. Its value in the treatment of selected ulcers of the duodenum and pylorus as well as some situated high on the lesser curvature was recognized and stimulated surgeons to seek simpler methods for obtaining the same benefits. We shall describe a few of these procedures to illustrate the evolution of the operation.

Girard³³ in 1900 devised a plastic operation for constricting the pylorus, which was a reversal of the Mikulicz-Heinecke pyloroplasty. The Mikulicz-Heinecke pyloroplasty, which is used to relieve pyloric obstruction due to cicatricial narrowing, is performed by making a longitudinal incision through the anterior gastric wall directly over the pylorus extending one inch into the antrum and duodenum. The oral and aboral ends are then approximated and a transverse closure is made in two layers. Girard made a transverse incision in the anterior wall of the antrum proximal to the ulcer or pylorus (if duodenal ulcer) and approximated the ends and sides of the incised wall in a longitudinal direction. This method never became popular.

Kelling⁴⁶ in 1900 and Mayo⁵³ in 1904 attempted to close the lumen of the pyloric segment by means of four ligatures of silver wire, each of which was stitched twice through the wall and then tied so as to produce an infolding of the wall. This method did not give permanent results, as proved by the postmortem examination of a patient so treated.

Kelling in 1900⁴⁶, Berg⁷ and Cackovic¹⁴ in 1903 described simple methods of ligating the pylorus with Pagenstecher sutures. Wilms used a free autoplasmic transplant, usually of fascia lata, for a constricting band. Parlavecchio in 1910, evidently without knowledge of the previous methods, attempted to ligate either near the pylorus or higher by means of a constricting band of cotton tape. He advised this procedure for pyloric or prepyloric cancer, giving excellent reasons

for its use. He first tried animal experiments and did not report its use in human beings until 1913. Wynen⁸⁵ in 1927 reported the use of a mattress suture to exclude the pylorus experimentally but concluded that it did not produce a permanent obstruction. This is true of all methods employing ligation.

Biondi in 1911¹⁰ devised a method intermediate in degree between the simple ligation technic and the more extensive operative procedure of von Eiselsberg. He made a longitudinal incision including only the seromuscular layers of the anterior wall of the antrum and extending to the pylorus. The mucosa was then dissected free, ligated twice and severed between the ligatures. The incised layers were sutured, leaving an exclusion which was permanent.

In 1914 Bartlett⁴ described a similar method, which did not require a complete transverse section of the stomach. This procedure, also known as "Hammersfahr's subserous method", was modified by Burkhardt¹³ in 1922. Its object was to build a septum above the pylorus. The transverse incision was made through the entire thickness of the anterior gastric wall but only through the posterior mucosa. In other words, the mucosal layer was completely severed with only the posterior seromuscular layer left intact. The proximal anterior and posterior mucosal layers were inverted and sutured, as were the distal layers. The anterior seromuscular layers were then sutured to the intact posterior layer.

Lewisohn⁴⁰ classified and summarized these methods, concluding that simpler measures were as satisfactory for peptic ulcer as the more complicated procedures.

Finsterer²⁸ used a technic which does not seem to differ from that of von Eiselsberg except in the variation of the level for section of the stomach and the completion of the operation in one case by a terminolateral anastomosis between the proximal segment and the duodenum. Devine¹⁹ used a similar procedure, always establishing continuity of the lumen by means of a terminolateral anastomosis. He also made a deep incision into the gastrohepatic omentum, into which he sutured the closed pyloric end in order to aid drainage. In a later article²⁰ he reported a case in which a jejunal ulcer, developing after a gastroenterostomy, was isolated by division of the stomach above the stoma and anastomosis of the jejunum to the proximal segment side-to-end, thus eliminating the jejunal ulcer in the segment between the two sutured portions. A lateral enteroenterostomy was done to drain the distal closed loop of duodenum and pylorus.

Bancroft³ sectioned the stomach without a clamp on the distal portion, dissected the mucosa free in this segment of the stomach, then ligated it at the pylorus and removed the excess to prevent stasis in the blind pouch. Cunningham¹⁶ showed by animal experiments that this procedure was unnecessary. He performed partial and subtotal pyloric exclusion operations on dogs and found that the excluded portion contracted to form a tube with the cut surface lying horizontally and the mucosa degenerated. The parietal cells degenerated to a greater extent than the chief cells and were replaced by fibrous tissue.

The technical procedure that we have employed for inoperable carcinomas of the antrum and pylorus is the method devised by von Eiselsberg²³⁻²⁷. This embodies a complete transverse severance of the stomach above the limits of the tumor and enteroanastomosis of the jejunum and the proximal uninvolved segment of the stomach (Figures 3 and 4). The gastrocolic and gastrohepatic ligaments are perforated close to the stomach proximal to the tumor. The gastric and gastroepiploic vessels are doubly clamped, severed and ligated, thereby freeing the lesser and greater curvatures of the stomach for a distance of from 3 to 4 cm. Two Payr clamps are then placed above the palpable limit of the tumor and the stomach is sectioned transversely either by cautery or by scalpel with sterilization by iodine. This operation can be performed quickly and most efficiently with



Fig. 3

Fig. 3—First step in the exclusion of an inoperable carcinoma of the pylorus.

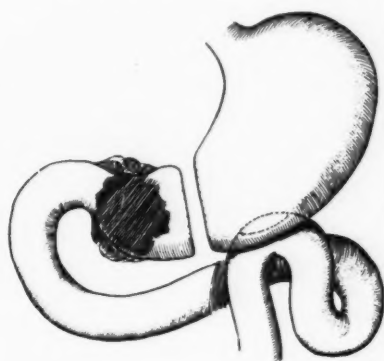


Fig. 4

Fig. 4—Diagram of completed operation for exclusion of inoperable cancer of the pylorus with isoperistaltic gastroenterostomy.

the use of the de Petz clamp^{62, 58} (Figure 5). The application of this clamp across the stomach leaves two rows of closed silver clips; they are hemostatic and also give a watertight closure. A quick incision between the two rows of clips and continuous seromuscular sutures for the severed ends lessens the time consumed in this operation. Although this incision should be well above the discernible margin of the carcinoma, it should not be so liberal as to permit the accumulation of secretion in this blind distal pouch. The mucosal and seromuscular layers are then closed by any of the conventional methods, thereby causing a complete division of the proximal and distal segments. After this closure was effected, von Eiselsberg anchored the distal stump to the proximal one to keep it in good position. We have never found this precaution to be necessary since we cover the defect with omentum and have never seen the complication of herniation of the small intestine through the opening into the lesser omental sac.

The type of anastomosis selected depends on the local conditions within the abdomen and should be selected to afford the best functional result. The isoperistaltic posterior gastrojejunostomy is most commonly employed, although we have several times found the anterior method more readily done. In other cases the posterior Polya or anterior Balfour end-to-side methods may be substituted.

End-Results of the Exclusion Operation for Gastric Cancer:—Whereas it had been our impression that patients subjected to this operation lived longer, it is untrue, for the postoperative duration was 6.3 months. The case of one patient is recalled who lived well over a year in perfect comfort, eating and digesting a normal diet until near the end, dying of the anemia produced by bulky hepatic metastases. The operative mortality for 12 such operations performed between 1931-1946 was 41.7 per cent, by far the highest for all palliative operations in the treatment of gastric cancer at the Memorial Hospital.

GASTROSTOMY

Evolution of Gastrostomy:—

- A. Elevation of simple cone from anterior wall of stomach. Sédillot (1846)
 1. Use of rectus muscle as a sphincter for gastrostomy cone.
Girard (1888), von Hacker (1890), Jaboulay (1894)
Terrier and Gosset (1902)
 2. Traction of gastric cone through oblique canals between muscles, fascia, and subcutaneous tissues to give sphincteric control.
Hahn (1890), Sabanieff (1890), Hartmann (1891), Frank (1893)
 3. Rotation of gastric cone to form a valve for the gastrostomy.
Ullmann (1894), Souligoux (1902)
- B. Canalization of gastric wall.
 1. Invaginated gastric cone by series of pursestring sutures.
Senn (1896), Fontan (1896)
 2. Intramural canal not lined with mucosa.
 - a. Puncture wound and inversion of sound or rubber catheter by plication of stomach wall with seroserosal sutures.
Witzel (1891), Kocher (1902)
 - b. Puncture wound and burial of sound or rubber catheter in submucosal canal by suture of seromuscular coats.
Marwedel (1896)
- C. Substitution of other hollow viscera as tubes between stomach and skin.
 1. Isolated, pedicled segment of jejunum.
Roux (1907), Frangenheim (1911), Lexer (1911)
 2. Isolated pedicled segment of transverse colon.
Kelling (1911), Vulliet (1911)
- D. Construction of tubed pedicled flaps from gastric walls.
 1. Tubed flap with base at lesser curvature.
Dépage (1901)

2. Tubed flap from anterior stomach wall with free end near pylorus and base at cardia and fundus.
Hirsch (1901)
3. Tubed flap of anterior stomach wall with base at greater curvature.
Janeway (1913)
4. Tubed flap of greater curvature segment.
Beck (1905), Jianu (1912)



Fig. 5

Fig. 5—Postoperative roentgenogram of stomach to show functioning gastroenterostomy. The silver clips (dePetz) marking the location of the severed distal segment of the stomach are seen at the margin of the vertebral shadow.

To William Beaumont⁵ is generally given the credit for making the first observation on the physiology of the stomach of a living individual through an artificial gastric stoma in the abdominal wound of Alexis St. Martin. His "Experiments and Observations in the Gastric Juice and the Physiology of Digestion" published in 1833 is a classic. Cunha¹⁵, while delving through medical archives observed that Benjamin Waterhouse², first Harvard professor of the "Theory and Practice of Medicine", had described a somewhat similar experience in 1808. While making rounds with Professor Jakob Helm at the Allgemeines Krankenhaus in Vienna they stopped at the bedside of a woman whose stomach was perforated by a wound in such a manner that it could not be closed. According to Waterhouse,

"Through this wound her food might be seen. Milk was observed to curdle instantly except she had carefully rinsed out her stomach, in which case the coagulation did not take place for sometime. Asses' milk was longer in coagulating than cow's milk which coagulated in a few minutes. Eggs and cheese were quickly digested, but not as soon as flesh meat. Vegetables in general were longer undergoing this process, of these potatoes and carrots passed off soonest."

The idea of gastrostomy was first suggested by Egeberg^{21, 61} in 1837 before the Medical Society of Christiania, though first performed by Blondlot¹¹ in 1841 in a dog. To Sédillot and Nélaton⁵⁰ goes the credit for its initial successful accomplishment on a human subject.

Many of the earlier attempts were followed by peritonitis and death. With this in mind, Nélaton fixed the stomach to the abdominal wall, opening the fistula after four to five days when the fistula was firmly adherent. Unfortunately this modification did not produce a leak-proof gastrostomy.

The use of a simple gastric cone obtained from the anterior wall of the stomach as described by Sédillot, Frank, Sabanieff, von Hacker and others seldom fulfills the requirements of a successful gastrostomy even when the various procedures to secure sphincteric control are employed. This is particularly true in cancers of the cardia as opposed to esophageal or pharyngeal neoplasms.

The Senn operation in which the cone of the anterior gastric wall is inverted by successively larger and wider pursestring sutures, is probably the most successful of these simple types, as the inverted cone functions as a valve. This is a modification of the Witzel procedure in which the gastric wall is grooved around a catheter inserted into the gastric lumen, by a series of Lembert sutures. The theoretical danger of obstruction is eliminated by the Marwedel modification in which the tube, after its insertion into the stomach, is buried in the depths of an incision made down to the submucosa of the gastric wall. Neither of these gastrotomies satisfies the requirements of a permanent fistula.

In Pénieres' article⁶⁰ published in 1893 is the first suggestion of the construction of a valve with the idea of controlling the gastric contents. It was composed of mucous membrane, as opposed to Fontan's valve (1896) constructed from all three layers of the gastric wall. The latter technic proved to be completely satisfactory to the surgeons of the day, and the forerunner of the Dépage (1901) and later Janeway principle. This technic involves the construction of a tubed pedicled flap from the anterior gastric wall. Dépage outlined a rectangular flap with the incision entirely through the gastric wall on three sides of the rectangle, the base being left at the lesser curvature of the stomach. This full-thickness flap was converted into a tube by two layers of sutures, and was readily brought to the outer surface of the abdominal wall, because of the length of the flap. When attached to the lesser curvature, as advocated by Dépage, it does not leak food and gastric juice, thus satisfying a fundamental requirement. Likewise it is lined by mucosa and has an excellent blood supply. Janeway modified this procedure by construct-

ing the flap at the greater curvature. The advantage of his gastrostomy over that of Dépage is simply that in cancers of the cardia as opposed to those of the esophagus the lesser curvature may be so involved and fixed by carcinoma that only the greater curvature may be free enough to serve as a base for the pedicled flap.

Watsudji^{83, 79} first combined the valvular principle of von Hacker and Stamm and the tubular method of Dépage-Janeway, forming a tubovalvular gastrostomy. This antedated by thirty years, according to Thorek, Spivak's announcement of a "new" technic for the construction of a valvular gastrostomy. In this principle a valve is created by the formation of a fold at the base of a tube pedicle. Surgeons who employ this technic testify to its superiority over others with the possible exception of the method of Beck-Jianu. For the Beck-Jianu gastrostomy, a tubed flap is created by placing clamps longitudinally along the greater curvature beginning at the antrum and extending high onto the fundus. The converted tube is then brought through the abdominal wound and through a subcutaneous channel to a stab wound in the skin and soft tissues of the lower left chest wall, where it is anchored. The completed gastrostomy is ideal in every respect. Regurgitation never occurs because of its high location above the stomach and the long and tortuous channel to the surface. It is a permanent gastrostomy which the patient can manage without assistance, inserting a tube for feeding purposes only. The large lumen permits the feeding of ground meat and pureed vegetables. If for any reason surgical extirpation of highly situated cancers of the cervical esophagus or hypopharynx is contemplated, not amenable to immediate esophagogastrostomy, this gastrostomy may comprise the first stage in the reconstruction.

Beck and Carrel⁶ first worked out the procedure in the laboratory. Jianu performed the operation only on dogs and human cadavers, while Röpke⁶⁴ was the first surgeon to perform this type of gastrostomy on a living human patient. Willy Meyer⁵⁴ in 1913 and later Horsley⁴², Pack⁵⁶, and Sweet⁷⁷ have independently advocated its wider application, because of the advantageous features described above. However, the performance of gastrostomy of any type has been markedly curtailed by the modern concept of resection and immediate esophagogastrostomy for many cancers of the gastric cardia and entire esophagus.

INDICATIONS FOR GASTROSTOMY IN THE TREATMENT OF GASTRIC NEOPLASMS

A. Inoperable obstructing cancers of the esophagus and gastric cardia.

1. Feeding
2. Retrograde dilatation
3. Radiation therapy—auxiliary

B. First-stage operation planned for removal of certain highly-placed cancers of the esophagus in which esophagogastrostomy is not feasible.

Until recent years cancers of the esophagus and proximal gastric segment were considered inoperable, with but few notable exceptions. Thorek had success-

fully resected the esophagus and restored orogastric continuity with rubber tubing connecting a cervical esophageal stoma with a gastrostomy. So little success attended surgical extirpation of these organs that in most clinics throughout the world such carcinomas were automatically classified as inoperable. Numerous technics were devised for the application of radiation therapy, both external and intracavitary. Whether or not irradiation was employed, the necessity for gastrostomy usually arose at some period because of obstruction to the ingestion of food. By the very nature of the disease, permanence of the gastrostomy was indicated. Likewise the feeding channel should be so constructed that digestive juices might not escape onto the skin producing excoriation and maceration. And finally, the gastrostomy must be planned in such a manner that the patient can remove, cleanse, and re-insert the feeding tube at will without danger to himself.

As so often occurs in surgery, the very fact that numerous operative procedures have been devised for a specific purpose, is an indication that none satisfies all requirements. The longer, more indirect the channel, the less opportunity for regurgitation. If in addition a valve-like effect can be produced, even greater control of gastric juice is effected. By placing the opening between the fibres of the rectus muscle some additional control is accomplished.

Preoperative Management:—Present-day methods of nutrition obviate the performance of emergency operations of this type. Since many of these patients develop a near-starvation state, accompanied by anemia, hypoproteinemia, dehydration and avitaminosis of varying degrees, all efforts must be directed first toward correcting these deficiencies before surgical intervention. Numerous transfusions of whole blood will supply more of the required elements than any other agent. The additional supplement of plasma and hydrolyzed proteins as well as all vitamins by parenteral methods assist in the restoration of the patient's nutritional status to near normal. If it is remembered that all such patients are to be prepared as for any major abdominal operation, the postoperative mortality will be lessened.

SURGICAL TECHNIQS OF GASTROSTOMY

In view of the numerous technics for performing an operation which has rather limited application today, it seems pertinent to describe in detail only three: the methods of Witzel, Janeway and Jianu. The patient must be adequately prepared as for any major gastric operation.

Anesthesia for Gastrostomy:—If distant metastases are present and are of such a nature and location as to preclude a palliative resection, the procedure is readily performed under novocaine infiltration and block (conductive anesthesia) of the lower left costal nerves. Just as often, however, the operation is performed under intratracheal gas-oxygen-ether anesthesia after the surgeon has encountered a nonresectable carcinoma. As a result of present day methods of pre- and post-operative care, early ambulation, and expert anesthesia, it matters little what type of anesthesia is employed. If the performance of gastrostomy has been de-

terminated upon preoperatively, local infiltration of 1 per cent novocaine combined with nerve block is adequately satisfactory.

Incision:—If the stomach is approached through a short upper rectus muscle-splitting incision, adequate exposure is afforded with a smaller area for potential wound infection. If the gastrostomy is performed after exploration has revealed the presence of a nonresectable gastric cancer, it is preferable to deliver the goose-neck or tube through a stab wound, rather than through the main incision. This

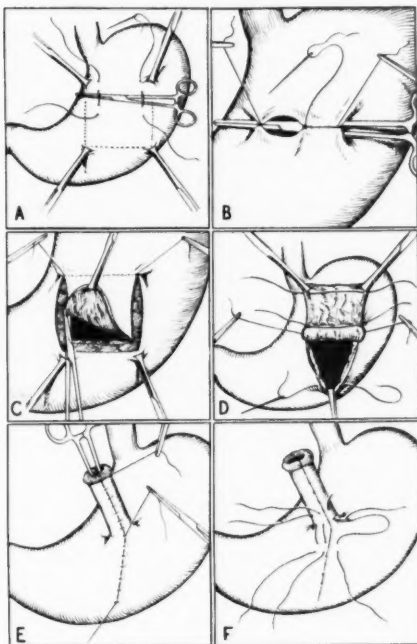


Fig. 6

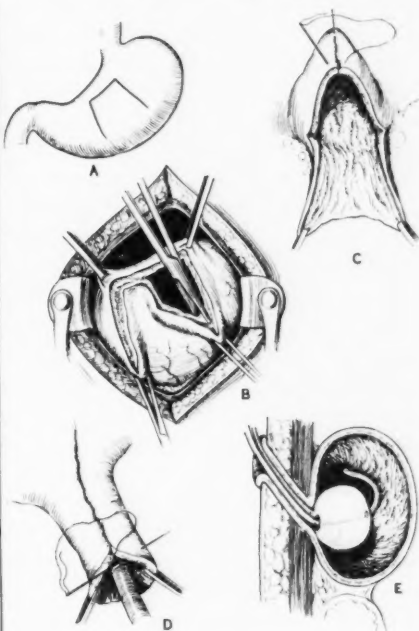


Fig. 7

Fig. 6—Spivak Modification of Janeway gastrostomy. A. Outline of flap. B. Infolding of seromuscular roll to constitute future valve. C. Elevation of full-thickness rectangular flap from anterior gastric wall. D. Beginning approximation of wound to construct the future gooseneck. E. Completion of seromuscular suture. Gooseneck completed. F. Mattress sutures to accentuate the valve at the base of the gastrostomy tube.

Fig. 7—Janeway Gastrostomy. A. Outline of flap of gastric wall with base at greater curvature. B. Development of full-thickness flap of gastric wall between demarcating Allis clamps. C. Beginning closure of gastric defect. D. Gastric tube or gooseneck nearing completion. E. Relation of stomach, gooseneck tube and gastrostomy orifice to anterior abdominal wall.

is a fundamental concept in the management of all surgically constructed fistulae (gastrostomy, jejunostomy, cecostomy, colostomy) so that if infection does occur, only a very small wound becomes contaminated. The upper left mid-rectus incision originates immediately below the costal margin; the reason for this height is the rule that the stoma of the gastrostomy should be cephalad or above the level of the greater curvature of the stomach.

A. The Witzel Method of Gastrostomy:—The stomach is exposed through a short left upper rectus muscle-splitting incision. After the wound edges have been draped and packs carefully placed around the proposed site of gastrostomy, the anterior gastric wall is grasped with a Babcock forceps and drawn forcibly well into the wound. A #14 French catheter is now laid across the gastric wall in such a way that the blunt end is toward the greater curvature. A series of interrupted Lembert sutures is then laid over the catheter and left untied. A stab wound is then made into the gastric lumen into which the blunt end of the catheter is rapidly inserted. The Lembert sutures are tied, thus burying the tube into the gastric wall. The suture line is now approximated to the peritoneal edges of the abdominal wound. The abdomen is then closed in layers with sutures of interrupted silk of medium tensile strength or #32 steel wire. The rubber tube will best emerge at the upper angle of the wound, where it is sutured to the skin. The Witzel method is recommended only under the following circumstances; (a) lack of adequate gastric wall for construction of a satisfactory pedicled flap or gooseneck, and (b) deterioration of the patient on the operating table, requiring a rapid termination of the operation.

B. The Dépage-Janeway Gastrostomy:—The anterior gastric wall is exposed by a short left upper rectus muscle-splitting incision, which ends just beneath the costal margin. After the wound and adjacent viscera have been appropriately draped and protected by packs, a rectangular trapdoor is outlined on the anterior gastric wall at about the juncture of the pars media and distal third. This must extend at right angles to the long axis of the stomach in order to obtain optimal blood supply, i.e., from greater to lesser curvature. The operative site is grasped by five atraumatic Allis or Babcock clamps in such a manner as to outline an area roughly 6 x 3 cm. The gooseneck must not be too narrow in diameter or it will thereby be so tight as to constrict the blood supply and produce a slough of the tip. This is likewise a factor in producing incontinence. The base of the gooseneck will best be formed at whichever curvature is free of carcinoma. Hence if the lesser curvature is freely mobile, it should receive its blood supply from this side (Dépage). More often, however, it is the greater curvature which is free and hence the base of the pedicle flap is left attached here. A bistoury is thrust deeply into the stomach at the apex of the rectangle and after the opening has been enlarged the stomach is aspirated until dry. At the time the long arms of the rectangle are cut, its entire length and thickness should be placed between the blades of straight intestinal scissors. Thereby an even border is produced on all sides. All bleeding vessels are grasped by mosquito forceps and tied with #000 chromic catgut or silk. The Allis clamps are then re-applied to each free end of the rectangle of gastric wall and held evenly so that the resulting stoma will be perfectly circular. Two other clamps are similarly placed at the base of the gooseneck, and a fifth at the apex. With the trapdoor thus evenly and firmly maintained, it is closed to form a gooseneck by two layers of continuous Lembert sutures. The inner layer of #00 chromic catgut closes the mucosa, and the outer layer of con-

tinuous or interrupted fine silk approximates the seromuscular layer. Additional control of the gastric contents has been effected by the construction of a valve at the base of the gooseneck after the method of Spivak (Figure 6). Before the tube is formed a closed Kelly clamp is placed on the severed surface of the base of the flap, the edges approximated over it and this clamp withdrawn. The gooseneck is then constructed as described above. It is well to introduce a #14 French catheter into the tube just prior to the completion of the first layer. A few interrupted sutures may be placed at the base of the pedicle for re-enforcement. The two continuous sutures are left long in order to pull the gastrostomy up into the wound and above the skin. If the sutures closing the gooseneck are completed a few mm. before the end of the flap a protruding "bud" of mucosa is present on the outer

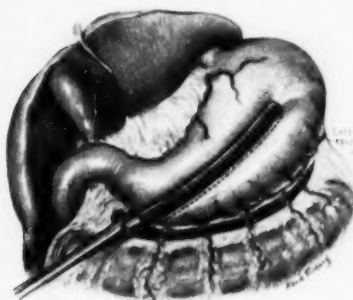


Fig. 8

Fig. 8—Jiau Gastrostomy. First step. Ligation and division of gastrocolic omentum with preservation of left gastroepiploic artery. Right gastroepiploic artery doubly clamped, divided and ligated at pyloric end of stomach. Lower third of stomach to be severed between two long soft clamps (lower clamp not illustrated in order to show line of incision). Another small clamp is placed gently across base of flap at fundus to avoid soiling of operative field.

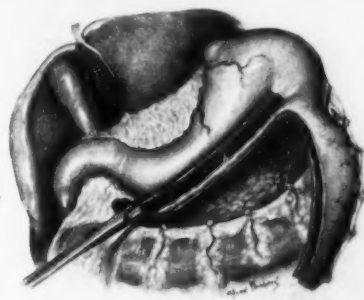


Fig. 9

Fig. 9—Jiau Gastrostomy. Second step. Semidiagrammatic sketch to show the construction of the gastrostomy tube. An inner Connell suture and an outer continuous Lambert suture close the stomach and the tube.

surface. The gooseneck is held firmly in the upper angle of the wound, extending 1-2 cm. beyond the surface of the skin while the wound is closed in layers about it. Protrusion of the "bud" above the skin margin prevents seepage of gastric contents into the fresh wound with resultant infection. This precaution likewise facilitates re-introduction of the feeding tube by the patient, since retraction to some degree almost invariably occurs. The gooseneck is sutured to the fascia and skin by several interrupted sutures of fine silk. As an added precaution a Halstead clamp grasps the long free ends of the original intestinal sutures and is incorporated in the dressing (Figure 7).

Feedings are begun on the first postoperative day. Even before the days of general early ambulation, it was successfully practiced on these patients.

C. *The Beck-Jiau Gastrostomy*:—This operation utilizes the greater curvature of the stomach to form a long pedicled tubed flap with the base at the fundus.

If the gastrostomy is intended for feeding purposes only, a high left mid-rectus incision is done; if the surgeon anticipates performing a cervical esophagectomy and wishes to utilize the tube flap in the reconstruction of the esophagus, then a midline epigastric incision is done, the incision being started as high as the xiphoid cartilage. The gastric wall is exposed by the incision. The gastrocolic ligament is divided at a distance of about 1 inch from the greater curvature, with care to preserve the left gastroepiploic artery which will serve as the main blood supply of the future gastrostomy tube. The part of the gastrocolic ligament attached to the transverse colon is left intact as it may be used to suspend the transverse colon and in some instances to protect the suture line of the stomach. The gastrosplenic ligament is also severed between two ligatures.

The stomach is now clamped longitudinally along the greater curvature with long soft rubber-covered clamps beginning at the antrum and extending high onto the fundus. At the base of the proposed flap on the fundus, a short rubber-covered clamp is placed gently in a transverse position in order to isolate this segment and to prevent leakage of gastric contents during the operation. This clamp should not be placed too tightly or it might interfere with circulation. The right gastroepiploic artery is doubly clamped, severed and doubly ligated at the distal end of the stomach (Figure 8).

The incision is made between two clamps and extends from the antrum to the fundus. This is then carried through both the anterior and posterior gastric walls, the leaves of which are sutured to construct a gastrostomy tube with a lumen at least one inch or more in diameter. Two layers of sutures are employed, the inner a Connell suture of chromic catgut and a continuous or interrupted serosal Lembert suture of silk (Figure 9).

If the gastrostomy is to be used for feeding purposes, the gastrocolic ligament may then be secured to the suture line in the stomach particularly at the angle of reflexion of the stomach onto the base of the tubed flap. It suspends the transverse colon and furthermore furnishes a defensive guard for the gastric suture line. On the contrary, if the stoma of the gastrostomy is to be placed high on the chest wall or if the tube is delivered through a midepigastric incision, the weight of the colon exerts too much tension on the stomach when the gastrocolic ligament is sutured to this organ.

In his original article, Jianu described the anchorage of the stomach to the upper part of the abdominal wound by interrupted Lembert sutures. This procedure tends to prevent sacculation of the fundus at the base of the tube and to avoid the formation of an hour-glass stomach. It lessens considerably the tension on the tube caused by the weight of a distended stomach. The later authors do not stress this step sufficiently and many of them probably have not anchored the stomach, as outlined by Jianu.

After the anterior and posterior edges of the stomach are sutured together and the suture is continued at the flap to form a closed tube, this gooseneck is gently

drawn out through the upper end of the abdominal incision and placed upward over the chest in order to judge how high it can extend. The tube frequently measures 8 to 10 inches in length (Figure 10). A small transverse incision about $1\frac{1}{2}$ inches long is made, after the site of the stoma has been selected in this way. The surgeon then burrows through the subcutaneous tissues from this skin incision down over the ribs until a Kelly clamp enters the subcutaneous plane of the abdominal incision. This subcutaneous channel is dilated until it is much larger than the tube, otherwise it may contract on healing and constrict the tube sufficiently to interfere with its blood supply. The surgeon introduces the clamp through the incision for the stoma, grasps with this clamp the extremity of the gastrostomy tube and draws it through this subcutaneous channel until the end of the tube

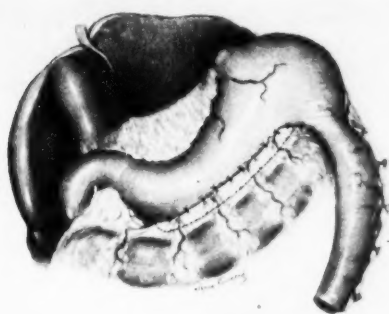


Fig. 10

Fig. 10—Jiana Gastrostomy. Third step. Reconstruction of stomach after formation of tube from greater curvature. The gastrocolic ligament is re-attached to the stomach above the suture line. The tube is eight to ten inches in length.

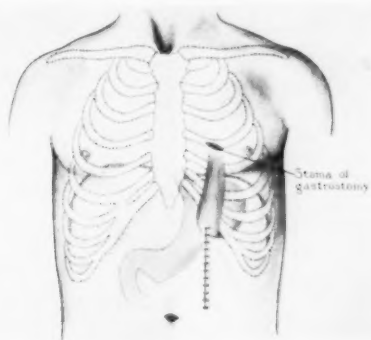


Fig. 11

Fig. 11—Jiana Gastrostomy. Fourth step. Location of incision for permanent gastrostomy in order to secure valve-like control against leakage by pressure against costal margin. If anastomosis to esophageal stump is planned, the incision should be in midepigastrium, as the stoma then can be placed much higher. Abdominal wound completely closed. The tube emerges through muscle and fascia, then is drawn subcutaneously to the incision on chest selected for the stoma.

reaches the incision in the skin (Figure 11). Infection of the subcutaneous tissues may be avoided by temporarily inverting the tip of the gooseneck or tube by two sutures, or the end of the tube may be covered by a finger cot or rubber condom. After the tube has been delivered through the incision for the stoma, it may be left unopened for 24 to 48 hours at which time the occluding sutures are removed (Figure 12).

There is considerable risk of sacculation of the intraabdominal portion of the tube and subsequent difficulty in feeding, if the tube is left slack and is not pulled up snugly. The blood supply runs in a longitudinal direction; therefore any suture in the extremity of the tube should be placed in this same direction, otherwise it may interfere with the blood supply at the tip with resultant ischemic necrosis.

In the original Jianu operation on dogs, the abdominal incision was extended upward onto the chest as high as the tube would reach. Then the skin incision was sutured over the tube. Röpke, Willy Meyer, Horsley, and we who have employed the modified Jianu gastrostomy have all dispensed with this added incision and delivered the tube through a subcutaneous channel instead. The danger of infection is probably greater with the number of sutures required for the long skin wound of Jianu than it is by burrowing the tube through a long subcutaneous channel. The abdominal wound is closed in layers with the use of interrupted sutures. Thus the tube extends through the peritoneal, muscular and fascial layers but does not extend through the skin of the abdominal incision. A small drain is placed subcutaneously at the lower end of the abdominal wound.

The completed gastrostomy is ideal in every respect. The stoma is situated so high above the stomach that regurgitation of food and gastric juice seldom occurs.

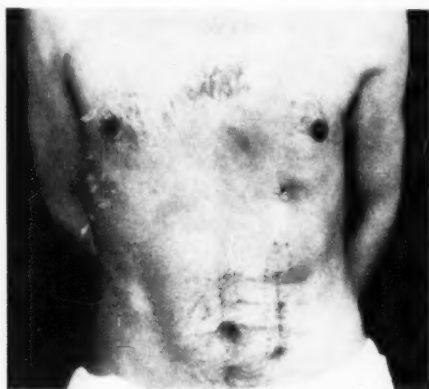


Fig. 12

Fig. 12—Photograph of patient with Jianu gastrostomy. The stoma could have been placed on a level with the nipples if an esophagectomy and plastic restoration had been considered. There is no leakage of gastric contents and no excoriation of skin surrounding the stoma. This patient has regained his normal weight.

The tube is bent upward over the costal margin or over the xiphoid cartilage and in so doing obstructs the lumen sufficiently to serve as a very good valve and in this way also prevents the regurgitation of food through the gastrostomy. The blood supply is adequate and even the extremity of a very long tube will never suffer from ischemia. The rectus muscle may also serve as a sphincter. The tube has a much larger lumen than occurs in the Janeway or Dépage gastrostomies, and thus it is possible to give semisolid food such as ground meat. Pureed vegetables and ground meat can later be given through this gastrostomy, by using a small grease gun for the introduction.

Whether the Janeway or Jianu technic is employed depends on the surgeon's experience, and the amount of stomach involved by carcinoma. If the malignant tumor invades the greater curvature and anterior wall to any extent, it becomes

readily obvious that the formation of a Jianu gastrostomy is technically impossible. On the other hand, it is the procedure of choice under the occasional instance of relatively small cancers of the gastric cardia which because of their limitation or numerous distant metastases cannot be resected. The Janeway gastrostomy or the so-called Spivak modification is the simplest and at the same time most satisfactory

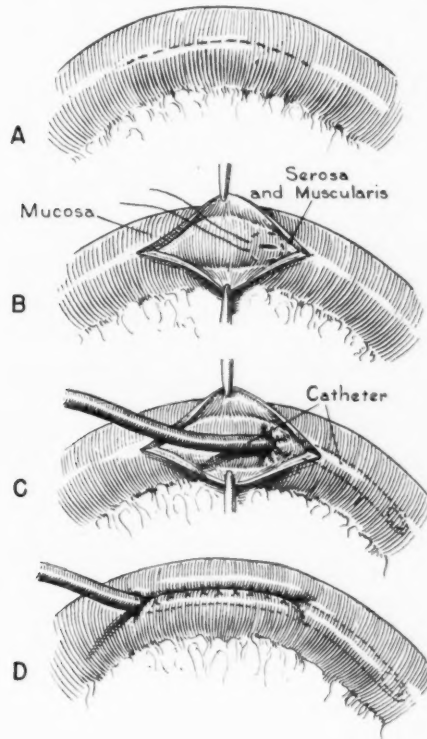


Fig. 13

Fig. 13—Marwedel Jejunostomy. A. Longitudinal seriomuscular incision of jejunum. B. Sero-muscular coat dissected free of mucosa. Pursestring around mucosal puncture intended for catheter. C. Catheter inserted distally into jejunum. Courses submucosally in wall of jejunum. D. Completed installation of catheter.

method for the purpose of producing a permanent gastric feeding fistula when cancers of the upper stomach may not be resected.

Janeway's Application of the Gastrostomy at the Memorial Hospital:—Janeway was extremely interested in the surgical management of cancers of the distal esophagus and gastric cancer at the Memorial Hospital. His pioneer attempts at surgical extirpation were unsuccessful, but in 1913 he standardized a technic for gastrostomy which probably enjoys the widest application of any operation

of this type. Throughout the years between 1913 and 1940 when the first successful resection of the cardia, followed by immediate anastomosis, was performed at that institution, the Janeway gastrostomy was performed many hundreds of times for cancers of the esophagus and proximal gastric segment. Although the operation was performed by numerous house and attending surgeons, the operative technic became so familiar to all that a good functional result was usually obtained. Because of the greater mobility of the stomach in instances of esophageal cancer, a more satisfactory tube was constructed than when the stomach itself was the site of the carcinomatous process. Even under such circumstances it remained the method of choice. The fistula was employed not only for feeding but also for retrograde visualization, dilatation and irradiation of cancers and strictures of the gastric cardia. When such lesions are not amenable to surgical extirpation, gastrostomy is usually inevitable and should be constructed before the terminal phase of the disease intervenes. Nutrition is thus maintained till shortly before the end. If the neoplasm further encroaches on the stomach, the feeding tube may be inserted through the pylorus under direct visualization via a short esophagoscope introduced through the gastrostomy.

END-RESULTS OF GASTROSTOMY

Operative Mortality:—One hundred and four operations, mainly of the Janeway type, were performed with 11 hospital deaths, or 10.6 per cent, from 1916-1946. If one selects only those 87 patients managed by members of the Gastric Service after segregation and standardization of technics, (1931 to date), there were two hospital deaths, or an operative mortality of 2.3 per cent.

Postoperative Duration of Life:—The duration of life of all 92 patients from whom information and follow-up status was obtained averaged 6.1 months. The major number of these patients completely managed the care of the gastrostomy until just before death. In most instances the gastrostomy undoubtedly prolonged life for several months.

Evaluation of Palliation:—It is hard to believe that many of these patients really enjoyed life in their last months. Quite obviously it was difficult to convince them that a curative operation had been performed, even when told the gastrostomy was only temporary. The frequency of diarrhea, irritation of the peristomal skin and the gradual realization that all progress had ceased made the management of these patients a most difficult one indeed.

JEJUNOSTOMY

Definition:—By jejunostomy is meant the creation of a surgical fistula in the upper jejunum for feeding purposes.

Indications:—(a) This operation may represent a temporary opening performed in combination with or as a preliminary to total gastrectomy, resections of the gastric cardia, and esophagectomy.

(b) A permanent jejunostomy may be constructed for those patients in whom a hopelessly-advanced and fixed gastric cancer has been found at laparotomy. Since by this fistula must pass the patient's entire nourishment in his last months, the procedure must be carefully effected.

The *ideal jejunostomy*, much like the gastrostomy, must be one which remains continent and does not spew excoriating intestinal contents onto the abdominal wall. But, just as important, because of the narrow calibre of the intestine, it must be constructed in such a way that the jejunal lumen does not become obstructed. Hence the von Eiselsberg-Witzel, Stamm and Senn technics are by no means as satisfactory as the method of jejunostomy by Marwedel, considered the method of choice on the Gastric Service at the Memorial Hospital.

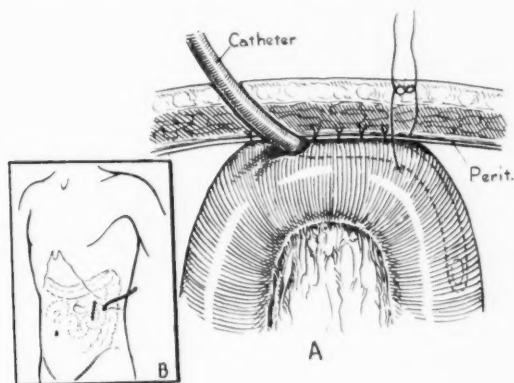


Fig. 14

Fig. 14—Marwedel Jejunostomy. A. Relation of jejunum to anterior abdominal wall. Anchorage for a distance of 3 inches prevents angulation of the bowel and partial obstruction. B. Anatomical exposure for jejunostomy. A two-inch incision is made posterior to a prolongation of the anterior axillary line beginning at the tip of the eleventh costal cartilage. (From Ravdin, I. S., *Surgery, Gynecology and Obstetrics*).

Preoperative Preparation:—All patients are prepared with the idea of restoring as completely as possible the human organism to a normal (or near normal) nutritional status before the abdomen is opened for any reason. This preparation has been adequately described elsewhere. When adverse factors have been corrected as adequately as is possible, whether for resection or jejunostomy, the operation is scheduled.

Anesthesia:—If the operation is to be carried out with a minimum of exploration, and as a preliminary procedure, analgesia and intercostal block with 1 per cent novocaine is adequate. On the other hand, jejunostomy is usually performed either as an auxiliary to a radical gastric or esophageal resection or after the discovery of an advanced inoperable gastric cancer and is therefore completed under the anesthesia employed, be it intratracheal ether or cyclopropane or continuous spinal anesthesia.

Incision:—(a) *Planned Jejunostomy.* A two-inch incision is made posterior to a prolongation of the anterior axillary line, beginning at the tip of the 11th costal cartilage (Ravdin). The exploring finger will thereby immediately pick up the proper segment of jejunum at the ligament of Treitz.

(b) *Auxiliary Jejunostomy.* When the abdomen has been explored through an adequate incision it is wise to bring the jejunal catheter out through a small stab wound in the abdominal prolongation of the anterior axillary line. This suggestion is in line with the generally expressed principle that if leakage and infection do occur the involved site will be minimal.

Operative Technic:—The method of jejunostomy by Marwedel is described inasmuch as it remains the most continent and least apt to obstruct. A loop of jejunum 20-30 cm. from the ligament of Treitz is delivered into the wound and stabilized by guy sutures, Babcock clamps, or a rubber-covered intestinal clamp. A 5 cm. linear incision is made down to the mucosa on the antimesenteric side of the jejunum. Carefully teasing back the seromuscular layer from the mucosa by

TABLE III
POSTOPERATIVE DURATION OF LIFE FOLLOWING PALLIATIVE OPERATIONS
FOR GASTRIC CANCER
Memorial Hospital, New York, 1916 through 1946

Type of Palliative Operation	Postoperative Duration in Months
Palliative gastrectomy	8.4
Gastroenterostomy with pyloric excision.....	6.3
Gastroenterostomy	7.7
Gastrostomy	6.1
Jejunostomy	4.3

scalpel dissection on both sides of the incision a trough is thereby formed in which the catheter is later to be buried. The development of the trough is the fundamental and original feature of the Marwedel technic. After the distal aspect of the bowel has been accurately determined, a pursestring of #00 chromic catgut is herein laid and the bowel opened by a bistoury in its center. A #14 French catheter is rapidly inserted into the opening for a distance of at least 10 centimeters, suction applied and the pursestring tied, the ends of catgut being left long in order to facilitate withdrawal of the catheter through the stab wound later. The seromuscular layer may best be closed over the catheter with interrupted sutures of fine silk, the ends being left long (Figure 13). In order to prevent leakage, it is important that the closure extend for at least 2 cm. beyond the distal end wherein lies the catheter. Through a stab wound the catheter and long pursestring stitch are delivered, bringing the jejunum in close approximation to the peritoneum (Figure 14). The catgut suture is then attached to fascia. The advantage of leaving the seromuscular sutures long is now obvious. Each in turn is threaded to a free needle and sutured to adjacent peritoneum. If enough sutures have been used to attach the operative site in the jejunum and leaving an additional 2 cm.

on each side to the peritoneum, further suturing is usually necessary or not as the case may be. This aspect of the technic prevents tenting or angulation and hence obstruction at the site of the jejunostomy. The catheter is then sutured to the skin so that it cannot be removed.

The dressing is applied in such a way that the feeding tube cannot be withdrawn or casually be removed. If the operation is auxiliary in purpose, it is usually expedient to have the jejunostomy dressing separate from the main abdominal wound.

This procedure is unquestionably a last resort, one which frankly offers little more than the maintenance of nourishment. It is performed in the presence of an extensive and advanced cancer which because of its fixation or metastases cannot be resected. It is not surprising that the operative mortality has been 34.3 per cent after 67 such procedures. The disease is advanced and as a result the duration of postoperative life is short averaging 4.3 months. Although wound complications are few if a Marwedel type of jejunostomy is constructed, diarrhea is common and the progress of cachexia is temporarily restrained for only a short time.

Postoperative duration of life is not the proper measure of palliation in the case of incurable cancer. Relief of symptoms, freedom from distress and a sense of well-being far outweigh the importance of the duration of living. To live and suffer is a punishment, not the reward for undergoing such an operation. In Table III, the palliative operations are properly listed in the decreasing order of their value.

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CARCINOMA OF THE THORACIC ESOPHAGUS* †

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With the recent advances in thoracic surgery, it can now be said that an exploratory thoracotomy is almost as safe a procedure as an exploratory laparotomy. If we are on the alert in the early diagnosis of carcinoma of the esophagus, the percentage of explorations to determine operability will be decreased to the level of that of abdominal explorations. There are as yet not enough five-year survivals to compare with other malignant lesions of the gastrointestinal tract. The very nature of the pathology should make it possible to anticipate a favorable result if these cases will come to surgery at an early date. This is particularly true in the case of the squamous cell epithelioma.

Carcinoma of the esophagus represents about 5 per cent of all carcinomas found in the body¹. It is a disease predominantly of the male sex, and fully 80 per cent of the cases are in patients over 40². The lesion may be located at any point in the organ. Feldman³, in a review of a large number of cases, found that 47 per cent were located in the lower third, 36 per cent in the middle third, and 17 per cent in the upper third of the esophagus. There are two histologic types of the lesion: the more common squamous epithelioma which may occur at any level; and the rarer adenocarcinoma which occurs at the lower end where the mucosa may be gastric in type. Carcinoma of the cardiac end of the stomach often invades the lower end of the esophagus⁴. Grossly, the esophageal carcinoma may be projecting polypoid, ulcerating or scirrhous encircling. In the latter type, the lesion may spread in the submucous and muscular coats a distance of one inch without gross mucosal evidence of the disease.

The squamous cell epitheliomas have a much slower rate of growth and metastasize later than do the adenocarcinomas. Metastases occur to the peri-esophageal, hilar and paracardial nodes, nodes along the left gastric artery and celiac axis, cervical nodes and liver. Metastases to the left gastric nodes can occur in growths located as high as the aortic arch. If the lesion is situated above the arch, the metastases involve the deep cervical glands along the course of the inferior thyroid artery. In lesions near the hilus of the lung, there may be extensive involvement of the hilar nodes with fixation of the growth. The mediastinum may be involved by direct extension, and the trachea or one of the bronchi may be invaded with a resultant tracheoesophageal fistula. If fistulization has occurred, the case may be mistaken for one of primary lung suppuration. The lesion may extend into the wall of the aorta. High lesions may invade one or both

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recurrent laryngeal nerves. In late cases, diffuse metastatic involvement of the pleura can occur and give rise to a moderate amount of pleural fluid.

DIAGNOSIS

Dysphagia is the earliest and the most frequent symptom. Seventy-five per cent of the cases have some degree of dysphagia⁴. Some patients may have had for several weeks only a minor difficulty in swallowing. Others may have a rapid onset of complete obstruction and regurgitation. Many cases will come to the internist because of chest pain, cough, expectoration of pus, hoarseness, or unexplained weight loss.

Pain usually denotes a late lesion that is ulcerated or obstructing. It is surprising to find an occasional case that has had no dysphagia, but has had substernal pain or "cramp" in the suprasternal notch for some time. A constant, boring pain in the upper dorsal region usually indicates extension of the growth into the posterior mediastinum.

Lesions in the upper third of the esophagus may give rise to a most troublesome cough due to regurgitation of esophageal contents into the larynx. Cough with foul expectoration may mean an erosion of the growth with tracheoesophageal fistula and secondary pulmonary suppuration. Hoarseness occurs from involvement of the recurrent laryngeal nerves or from extension of a high growth into the larynx.

In uncomplicated cases, the physical examination reveals only marked weight loss, cachexia and pallor. There may be some palpable cervical lymph glands.

The most important adjunct to diagnosis is roentgenography. The diagnosis of even an early lesion can be made in most cases by careful fluoroscopy and roentgen examination. In some cases of scirrhous carcinoma, the roentgenogram defect may be one of annular constriction which cannot be differentiated from benign stenosis. In that event, esophagoscopy with biopsy is necessary to confirm the diagnosis. It is wise to rule out a chronic inflammatory lesion by biopsy before advising such a major surgical procedure as resection of the esophagus. Dr. Gabriel Tucker has been able to obtain a positive biopsy by esophagoscopy in most of the 31 cases that comprise our series. The late cases can be markedly reduced in number if we will only employ the aid of the roentgenologist and the esophagologist at the very first sign of a disorder in the esophagus.

TREATMENT

Until recently, patients with carcinoma of the esophagus were treated with palliative measures, or the thoracic esophagus was resected without restoration of continuity after the method of Torek⁵. As pointed out by Sweet⁶, the Torek operation was inadequate in the treatment of the carcinoma because the subdiaphragmatic lymph glands to which this lesion often metastasizes were not removed.

From the contributions made by Adams and Phemister⁷, Garlock⁸, Sweet⁹, and others, it is now possible to resect the thoracic esophagus and restore the

continuity of the gastrointestinal tract. This operation provides relief from the distress resulting from obstruction produced by the growth, and it is possible that the patient can be cured.

A brief description of the operation will give one an idea of the problem involved in the surgery of this disease and a better understanding of the necessary preoperative care and postoperative chest complications that occur.

The esophagus is approached transpleurally, and the involved area is resected. The diaphragm is opened and the stomach is mobilized, brought up through the incision in the diaphragm and anastomosed to the proximal stump of the esophagus. In high lesions that are situated behind or just above the arch of the aorta, the entire stomach can be brought up and anastomosed to the esophagus. In extensive lesions involving the entire lesser curvature of the stomach with extension into the lowermost end of the esophagus, a total gastrectomy with anastomosis to the jejunum is performed.

We have employed the transthoracic approach in the majority of our 31 cases, although in a few of the lower lesions of the esophagus and particularly in those with involvement of the lesser curvature of the stomach, a combined abdominal and thoracic approach was employed. The upper left rectus incision is extended across the costal margin and upward through the eighth interspace. The advantage of a preliminary abdominal exploration, as so ably expressed by Dr. Garlock¹⁰, is to allow a proper evaluation of the question of operability.

Five of the 31 cases were found to be nonresectable as a result of metastatic spread. Therefore, the resectability rate was 83 per cent. Three cases with extensive lesions that were resected died in the early postoperative period. This contributed to a higher mortality rate in our series and in retrospect, resection should not have been attempted. However, a resection is far better than a gastrostomy that only serves to prolong a miserable existence. As pointed out by Sweet, resection even in the presence of extensive involvement and metastatic nodules in the liver is well worth the effort to give relief from esophageal obstruction. Recurrences have not taken place at the site of the anastomosis in the cases we have autopsied. One of the cases developed an ulcer at the anastomotic site, but was able to take nourishment up to the time of his death. We only have two patients living two years after resection. At present, we believe that although our percentage of survivals beyond one year is small, it is far better than that offered by gastrostomy. Our over all mortality rate is 22.6 per cent.

You, as the medical man in the case, will follow the pre- and postoperative course and should be aware of the complications that are likely to occur.

PREOPERATIVE CARE

Preoperatively, considerable care must be taken to evaluate the reserve of the patient. This is a long, shocking operation; and in opening the thoracic and abdominal cavities, the blood loss is not inconsiderable.

In most of these patients, the nutritional status is poor, and we spend two or three weeks in improving it. Soft or liquid diets, reinforced with frequent feedings of high protein formulas, are used. Protein hydrolysates mixed in milk and broth are given to provide an intake of 150 to 200 grams of protein daily. If obstruction prevents adequate intake, a feeding tube is passed under direct vision through the esophagoscope into the stomach. The tube remains in situ from ten days to three weeks, and protein hydrolysates, dextrin, maltose and vitamins mixed in milk are given by this route. One of our patients gained eight pounds in three weeks when fed by this method. If the obstruction is complete and passage of a tube impossible, a preliminary jejunostomy is made. A gastrostomy is not advisable because the stomach will be utilized when the resection is performed.

Daily transfusions of 500 cc. of citrated whole blood are administered to overcome the anemia that is present. Three or four transfusions are usually given. Lyons¹¹ recently emphasized that chronically ill patients with nutritional deficiency and malignant disease have a greater deficit of the total circulating red cell mass and hemoglobin than is revealed by the blood count. He stated that adequate preoperative preparation of these patients could be accomplished only by transfusion replacement therapy.

Penicillin is given for 48 hours preoperatively. Our earlier cases were also prepared with sulfadiazine, but this was discontinued after two cases had temporary renal shutdown due to blockage of the renal tubules by sulfacrystals.

The cardiovascular status is thoroughly investigated. If any sign of decompensation exists, preoperative digitalization is indicated. Previous decompensation is no contraindication to surgery. Two cases in our series had a history of cardiac failure and were successfully operated. One case had been decompensated once prior to his admission. The other had been through two bouts of decompensation. His last attack had been so severe that he was in an oxygen tent for seven days. Preliminary jejunostomies were performed on both of these cases in order to avoid overloading the circulation with intravenous alimentation postoperatively. Feeding through the jejunostomy was possible 24 hours after surgery. The first cardiac was discharged from the hospital and remained compensated for several months. Then he again became decompensated and continued so until his death, 12 months after operation. The second case remained compensated until his death; he died as a result of metastatic spread of the growth 13 months after operation.

Patients with chronic pulmonary disease are poor risks for this operation; and it is best to treat them with roentgen therapy and do a gastrostomy if obstruction exists.

Bilateral superficial femoral vein ligation has been performed on our later cases as a prophylactic measure. This was adopted after the occurrence of two postoperative deaths due to pulmonary infarction. No embolic phenomena have

occurred since prophylactic ligation has been practiced, but our series is too small to draw definite conclusions of its efficacy.

POSTOPERATIVE CARE

Postoperatively, these patients require constant supervision by the resident and nursing staff. Close cooperation between the surgeon and the internist is invaluable. For the first 48 hours, their condition is critical. Oxygen is administered by intranasal catheter or tent. If shock is present, it is combatted with citrated whole blood. Fluid balance and adequate renal function are maintained with intravenous fluids. At operation, a Levine tube is placed through the anastomosis into the stomach and continuous suction is employed to prevent gastric dilatation. Administration of penicillin is continued.

On the first postoperative day, intensive parenteral alimentation is instituted. This is important because the patients are nutritionally poor before surgery and will be unable to take a full diet for two weeks after surgery. Glucose in water or physiologic saline, vitamins and protein hydrolysates are utilized. Seventy to one hundred grams of protein and 150 grams of carbohydrate are given daily.

On the fifth postoperative day, the patients are allowed small amounts of water by mouth. Oral intake is increased gradually and by the fourteenth postoperative day, they are on a bland house diet.

The chest complications that may occur are: pleural effusion, empyema, mediastinitis, atelectasis, pneumonia, pneumothorax and pulmonary infarction. For the first 48 hours, these patients are roentgenographed by portable technic once every 12 hours or more often if indicated.

At the close of the operation, the lung is re-expanded by the anesthetist; and a water-seal type of drainage of the left pleural cavity is set up. We employ a method of constant suction. The negative pressure is maintained at 10-15 cc. of water by an air-trap. This usually drains 300-500 cc. of sero-sanguinous fluid in the first 24 hours. After 24 hours, these tubes often become clogged and do not drain the remainder of the fluid which accumulates. This fluid becomes loculated along the posterior mediastinum and in the left paraspinal gutter. Roentgenograms do not always define this fluid because a marked haziness exists over the entire left hemithorax from the intense pleural reaction. However, fluid levels may be seen in the erect film or the mediastinum may be shifted due to pressure. The patient will have an increased respiratory rate with or without an associated rise in temperature or pulse rate. Careful needle-exploration will locate the effusion. This fluid should be withdrawn, for if organisms are present, an empyema may result. The antibiotics have kept the complication of infection under control, and in none of our cases has empyema occurred.

A widening of the mediastinal shadow and high rise in temperature indicative of mediastinitis have developed in some cases, but a combination of antibiotics and chemotherapy has controlled this. One must remember that the anastomosis between the cut end of the esophagus and the gastric tube is an open type, and some

soilage and contamination of the pleural cavity is unavoidable. An aseptic type of anastomosis is not feasible because of the soft and friable wall of the esophagus. In extensive cases, it is necessary to remove a section of the mediastinum, and both pleural cavities are open. This increases the possibility of mediastinal infection.

Atelectasis of varying degree has developed in one-fourth of the cases, and bronchoscopic drainage was necessary in those in which a large pulmonary segment was involved. This may result from incomplete re-expansion of the lung at operation, retained secretions, effusions and pneumothorax. The left base usually fails to aerate completely because of the raised diaphragm and the presence of the cardiac end of the stomach in the chest. Incisional pain has much to do with limiting respiratory excursion. This calls for the judicious use of sedation to alleviate pain and yet not depress the cough reflex.

It is often necessary to section the vagus nerves when adherent to the growth; and, therefore, a delay in emptying of the gastric tube may occur, but this has not been marked. Liquids and food regurgitate to an annoying degree in an occasional case, but gradually decrease. Patients with regurgitation should not lie down for an hour or so after the ingestion of food. The small gastric tube that has been pulled up in the chest cavity is a mechanical factor that must be considered. Some of our patients have had some degree of "burning sensation in the epigastrium" simulating peptic ulcer. The gastroenterologists have been able to control this with diet and medication. A few of the patients have found it possible to assume an active life for a few months after operation.

SUMMARY

Carcinoma of the esophagus represents about 5 per cent of all carcinoma found in the body. This lesion may be diagnosed early and accurately by roentgenography and esophagoscopy. Resection offers relief of the obstruction with restoration of esophagogastric continuity. It is too early to determine the percentage of five-year survivals that will result from this surgery. Close cooperation between the gastroenterologist and the surgeon in the preparation and postoperative care of these patients is invaluable.

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DISCUSSION

Dr. John H. Garlock (New York, N. Y.):—This problem of cancer of the esophagus has become so important in the last ten or twelve years and there have been so many advances in the surgical therapy of the disease that it would take the rest of the afternoon to go into it thoroughly in this discussion. There are many points in Dr. Hawthorne's presentation that merit discussion. That would also take all afternoon, but I am going to limit myself to a few points that struck me as I read over Dr. Hawthorne's paper in advance of this meeting.

In our experience, dysphagia is the most important symptom and has been presented by approximately 98 per cent of the patients. We are of the opinion that a patient presenting symptoms suggestive of cancer of the esophagus, should be esophagoscoped and a biopsy should be taken. There are many instances of patients having gone through this rigorous operation only to have the pathological specimen show chronic inflammation on the basis of lues or a benign stricture. I believe therefore that all patients should have a biopsy done.

We also feel that it is important to differentiate between adenocarcinoma and squamous cell carcinoma of the esophagus. I have never in all my experience seen a patient with adenocarcinoma of misplaced gastric mucosa. Every adenocarcinoma biopsied on esophagoscopy has been shown to have its origin either at the cardiac end of the stomach or in the upper stomach.

Squamous cell carcinoma demonstrated in the biopsy specimen indicates origin from the esophagus itself.

We believe that treatment should be surgical, and now it is fairly well agreed around the country that the therapy of this disease should be surgical. This surgical therapy is a group problem involving the combined efforts of the expert clinician, gastroenterologist, an expert anesthetist, and I want to emphasize that particular point, a good nursing staff, and you might throw in the surgeon as an after thought.

Up until recently the postoperative care of these people was fraught with considerable apprehension on the part of the surgeon because of the numerous chest complications that occurred, but we have seen a markedly decreased number of chest complications especially from the standpoint of trapped air, and effusions to a degree causing respiratory embarrassment. I think that the reason for this is our clear understanding of the anesthesia requirements in these people. For instance, it was very common up to two years ago, for us to have instances of trapped air in the chest causing acute respiratory and circulatory embarrassment which might result very quickly in the death of a patient, and it was imperative to be on the lookout for these cases of trapped air in the left chest so that immediate aspiration could be undertaken.

In the last twenty-seven cases we haven't had one instance of trapped air. I emphasize this point because I think it depends upon the efficiency of the anesthetist. I think the secret of the elimination of many of our chest complications

has been the realization that the anesthetist must have the lung inflated throughout the entire closure of the chest wall, so that the lung hugs the parietal pleura, and there can't be any place for air to accumulate. Positive pressure should be maintained until the last skin suture is inserted.

We have had a consecutive series of twenty-two cases, the last twenty-two, without a mortality. Most of our mortalities have been due mainly to either chest complications not infectious in origin, or cardiovascular accidents, coronary occlusions, embolisms, in two instances cerebral embolism, cerebral hemorrhage, and cardiac failure.

Dr. Hawthorne, of course, has not painted a very nice picture from the standpoint of long-term survivals. Perhaps I can improve on it a bit if I give you some of our figures briefly. We now have an operative experience with 237 cases. The other cases that I have mentioned making a total a little over 500, were obviously inoperable when we saw them, and we did not encourage operations.

We have had a series of resectable cases, meaning operable cases, of 109, and the operative mortality has varied during this twelve-year period that we have studied this disease. In the beginning, the first three cases recovered. We thought it was an easy procedure because of this 100 per cent recovery, and then followed a period in which the mortality was close to 50 per cent. Now the mortality is, as I indicated, in the last twenty-two cases, zero, but the overall mortality now should be in the neighborhood of between 15 and 20 per cent. I think that, as time goes on and as we prepare these patients more intelligently, the mortality will go even lower than that.

I should like to tell you about our survivals, because that is the crux of the whole story and it makes you feel that the effort—and, believe me, it is a great deal of effort—in treating these patients surgically, is worthwhile.

We have 38 patients alive and apparently free of disease from twelve years to two months. I have one patient alive and well twelve years, eleven alive and well over five years, two over four years, and five over three years. The remainder were done too recently, to warrant any further discussion. You will see from these figures that the outlook is much brighter than it was only a few years ago.

Now, I should like to compare, just for a moment, the outlook with adenocarcinoma of the cardia as opposed to squamous cell carcinoma. Among the series of adenocarcinomas we have—two patients eight years; two, six years; two, five and a half years; one, four years; three, three years; two, two years and so on, apparently well and free of disease.

With the squamous cell tumors we have one, twelve years; one, nine years; one, seven years; two, five years; one, four years; four, three years and the rest for periods of lesser duration.

It is difficult from these figures to tell whether the prognosis is better with adenocarcinoma than with squamous cell carcinoma, but among this group of

patients is a not inconsiderable number where there was lymph node metastasis at the time of operation.

I want to emphasize again that the subject is still in the stage of development and that increasing experience should tell the story, especially from the standpoint of late survivors.

Dr. William A. Lell (Philadelphia, Pa.):—Dr. Hawthorne is to be congratulated on the fine presentation of his paper on carcinoma of the esophagus, and I also enjoyed Dr. Garlock's discussion. There is no question that we all realize the importance of early diagnosis of carcinoma, whether it be relative to the esophagus or any other structure in the human body. In certain parts of the body the beginning of any abnormal state may produce early symptoms, so that one may become aware that something is wrong. This is certainly true of carcinoma of the larynx, when a lesion arises in the region of the vocal cords. Hoarseness becomes a predominant symptom, which causes the patient to seek medical aid. The



Fig. 1

onset of disturbance in the lung produces the symptom of cough and even hemoptysis, which immediately may cause the patient to seek relief. And so it is with the involvement of many other organs.

Unfortunately, however, early carcinoma of the esophagus does not produce as much annoyance as we wish it would. The early symptoms may start with a burning sensation which the patient may readily dismiss as being due to heartburn or acid indigestion, particularly so since it is usually relieved by the use of alkali, and it is not until he begins to have symptoms of actual obstruction that he will consult a physician. By this time the lesion has become far advanced and may be inoperable.

In spite of the tremendous advances made in thoracic surgery in recent years, there are still locations in the course of the esophagus which would make surgical resection extremely hazardous, if not impossible. To this end I have in mind lesions which are high up in the esophagus, between the arch of the aorta and the cricopharyngeus proper. Even early diagnosis in this area offers a challenge for complete resection. There is no question that the lesions arising below the arch of the

aorta may be adequately removed with good results; and, as we all know, the lower the lesion the more favorable the prognosis. On the other hand, there is that type of involvement in which the lesion arises outside the esophagus and subsequently produces its symptoms by infiltration or compression, and often both. In these cases the patients are doomed from the beginning, because by the time the esophageal symptoms become prominent there has already taken place extensive dissemination into the adjacent structures, and, unfortunately, we see too many of these types of lesions.

How are we going to be able to establish an early diagnosis of carcinoma of the esophagus? It means that all patients who begin to have any disturbance, either in swallowing function or local discomfort, should not be treated blindly



Fig. 2

by alkalis or placebo, but should be subjected to a scientific check-up which should include an accurate history, a thorough physical examination and a dependable x-ray examination, including a swallowing function, lateral film of the neck, a film of the chest and a film in the Manges position showing filling of the esophagus. There is no question, of course, that the primary fluoroscopic observation will help to detect any abnormality, and further detailed studies of any suspicious area by films will unquestionably help in the early diagnosis. With a survey of this type I am sure that many early suspected cases will be observed. We all know, however, that the x-ray is not infallible, and the slightest variation from normal should raise the question of further specialized examination. By this I refer to esophagoscopy examination for direct visualization of the suspected area, rather than dismissing it as being of no significance.

Esophagoscopy examination today has become a rather routine procedure, and should be resorted to whenever the least question of any abnormality arises. This may be of invaluable aid in the differential diagnosis. By the esophagoscopy

examination considerable information may also be obtained; namely, the exact location of the lesion, whether it is an ulcerative or fungating type with tissue in the lumen, or whether the wall shows fixation, in which case the lesion may be entirely outside of the esophagus, producing an annular constriction. These are all points of information which prove most important to the thoracic surgeon before the attempted resection. Again, the esophagoscopy examination may definitely establish the diagnosis by means of biopsy and histological confirmation of the nature of the growth. This is extremely important in a lesion arising in the lower end of the esophagus. It is here that biopsy may very well establish the origin of the involvement according to the histological nature of the tumor; namely, if found to be an adenocarcinoma it would invariably mean that the lesion was arising in the stomach and invading the esophagus. On the other hand, a squamous cell carcinoma would be arising from the lower end of the esophagus proper.

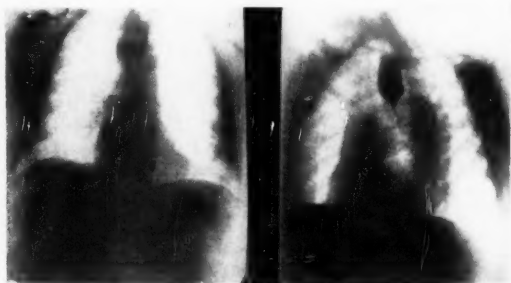


Fig. 3

In the lesions arising above the arch of the aorta, because of the anatomical relationship of the esophagus and the posterior tracheal wall, one must consider the possibility of the lesion extending into the trachea, and for this purpose bronchoscopic examination should also be made, to definitely eliminate such a possibility. As we all know, a simple mirror examination of the larynx may give considerable information as to the future prognosis, for certainly, if there should be involvement of either of the recurrent nerves, one would immediately suspect that it must be rather extensive and most likely inoperable.

In reference to the treatment, there is no question that surgical resection should be the first consideration whenever feasible and practical. In the inoperable cases one is certainly justified in carrying out other forms of treatment, even though they may just give palliative relief. Radon implantation may be considered in certain types of lesions arising above the arch of the aorta, and particularly in the region of the pyriform sinuses. This may be particularly useful in lesions with considerable fungating tissue. Likewise, in certain cases a radium capsule might be used where a gastrostomy has already been made and the radium capsule can be properly placed in the center of the lesion, under fluoroscopic guidance. Here

considerable caution has to be exercised in the dosage used to avoid getting too severe reaction, which may eventually mean breakdown of the surrounding structures with the subsequent development of an esophagotracheal or bronchial fistula. Indifferent results have been obtained by the use of electrocoagulation. Deep x-ray therapy should always be considered, either independently or in conjunction with any of the above mentioned forms of palliation.

In conclusion I wish to emphasize the importance of early diagnosis so that they may receive the wonderful aid which the thoracic surgeon can at present give these patients, for surgical resection is the only proven means of irradiation of this disease.

I would like to briefly present illustrations of a few interesting cases that show the importance of proper studies, and the esophagoscopy examination, in the diagnosis of carcinoma of the esophagus:

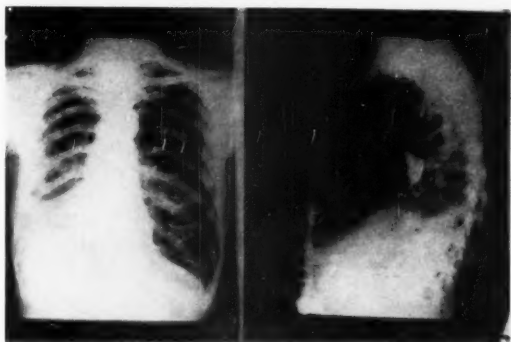


Fig. 4

Figure 1 illustrates the confusion sometimes associated in the diagnosis of this condition. This patient had mild dysphagia, local discomfort in the throat, with a focal point of pain localized in the upper pharynx. He sought medical aid and on the basis of his complaints it was felt that the tonsils were responsible, and tonsillectomy was performed. However, at this time nobody looked lower down than they could see with a tongue depressor, for I am sure if an examination of the larynx and pharynx had been made one would have seen the beginning of ulceration in the right pyriform sinus. This patient was further treated medically on the basis of his local discomfort until his dysphagia became very severe, at which time x-ray studies were made which revealed soft tissue swelling in the region of the right pyriform sinus. This lesion was clearly visualized by mirror examination and definite ulceration of the mucosa could be seen. Direct examination revealed the lesion extending down into the upper esophagus. A specimen of tissue was obtained and the suspicion of carcinoma was confirmed by the histological examination. Although this patient received irradiation and later radon

seeds were implanted, the fact that this treatment was not started until the lesion was far advanced offered him only temporary palliation.

Figure 2 shows the importance of thorough check-up examination. This patient came into the hospital with symptoms of hoarseness, and on mirror and direct laryngoscopic examination, an early lesion could be definitely seen on the right vocal cord, which, on biopsy and histological examination was found to be squamous cell carcinoma. However, in the routine check-up of swallowing function and x-ray of the chest the radiologist noted the definite local point of abnormality in the midthoracic esophagus, as is demonstrated in this illustration by the

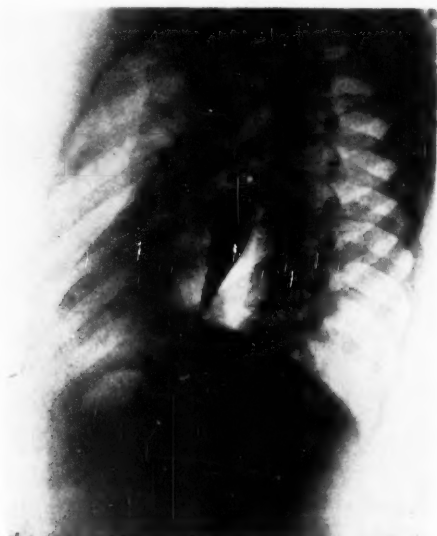


Fig. 5

lodgment of the capsule in this region. Esophagosopic examination revealed definite ulceration in this area, and the histological examination of the biopsy revealed squamous cell carcinoma. This patient, although unusual, was found to have two early carcinomas, one of the larynx and the other of the upper esophagus.

Figure 3 shows the definite importance of esophagosopic examination in the diagnosis. This patient had definite dysphagia for a long period of time and subsequently came into the hospital completely obstructed. X-ray examination illustrates almost complete obstruction of the esophagus, and certainly this could represent a malignant lesion of far advanced nature. However, on esophagosopic examination it was found that the obstruction was due to a piece of meat lodged in this region, because the patient had an old benign stricture of the esophagus. This was entirely benign and amenable to local treatment by dilatation.

Figure 4 illustrates the fact that although the early symptoms may be referable to the esophagus, the lesion may not be arising within the esophagus proper, but adjacent to it. This patient came into the hospital with total obstruction following the lodgment of a piece of pork in the lower end of the esophagus. The mucous membrane appeared quite inflamed, but there was no evidence of any ulceration, and following the removal of the foreign body the patient had no immediate difficulty, and was able to resume his regular diet. The repeat swallowing function did not show any alteration in the calibre of the lumen of the lower end of the esophagus. Several weeks later, however, this patient began to have more persistent difficulty in swallowing so that another esophagoscopy examination was made, and again there was no definite ulceration in the lumen of the lower esophagus. Associated with his dysphagia the patient also developed a persistent cough and x-ray examination of the chest revealed some definite evidence of increased density in the right lower lung field. Definite suspicion of an extra-esophageal new growth was held in this case, in spite of the fact that at no time could biopsy be obtained from the esophagus. Subsequently, however, a bronchoscopic examination was made in which a biopsy was obtained from the right lower lobe bronchus, and the histological examination proved it to be a squamous cell carcinoma. This definitely shows that some of the symptoms of esophageal obstruction may be due to a lesion in the adjacent structures, as in this case.

Figure 5 shows the importance of thoroughly evaluating older patients who come to our attention with an esophageal foreign body, since, as in this case, lodgment of the foreign body may be due to an early carcinoma of the esophagus producing an alteration in the lumen, and causing its lodgment. If attention, however, had been focused entirely on the foreign body unquestionably the diagnosis of carcinoma would have been missed.

I wish to just re-emphasize that patients having symptoms of esophageal discomfort should be thoroughly studied by complete x-ray studies, including fluoroscopic examination, and subsequent direct visualization of the esophagus by esophagoscopy examination where indicated.

Dr. Herbert R. Hawthorne (Philadelphia, Pa.):— I want to thank Dr. Garlock and Dr. Lell for their discussion. It is heartening to hear figures such as Dr. Garlock gave us. In the past year we have been seeing some earlier cases as a result of our interest in surgery of the esophagus. Since there is something definite to offer in relief and survival time of the disease with the operative procedure; the five year survival rate may equal or exceed carcinomas of the stomach.

PEPTIC ULCER: THEORY AND PRACTICE*

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Statistics show that the incidence of peptic ulcer is steadily increasing. All classes of persons, rich and poor, seem equally affected. The present great stress of life no doubt contributes largely to this disease; the advances made in diagnosis also help to increase the statistical figures. The great incidence of ulcer is also indicated in the increasing number of perforations and hemorrhages.

From the clinical aspect, duodenal ulcer is three to ten times more frequent than gastric ulcer. Both types may be found simultaneously in approximately ten per cent of the patients.

Age does not seem to have any particular influence on the presence of ulcer; it may occur soon after birth as well as in older children. In the newborn they are obviously acute ulcers or petechial erosions which result from sepsis, general bacterial infections, suppurative infection of the umbilical cord or thrombosis of the omphalo-umbilical veins.

Between 1930 and 1944 at the Babies Hospital in New York, ten cases of gastric and duodenal ulcer were found. Hemorrhage occurred in six out of the ten children and perforation and pyloric stenosis were also observed in some.

Our own records show perforated ulcer in the newborn; duodenal ulcer and hemorrhages in a 5 year-old boy. The latter was first operated upon for supposed appendicitis, and when hemorrhage occurred, Meckel's diverticulum was the basis for the second preoperative diagnosis. Ulcer symptoms persisted and when we saw the patient we suggested roentgen study of the gastrointestinal tract which revealed the presence of a definite duodenal lesion.

Recently we encountered a five-year-old boy who was under the care of a competent pediatrician, who, recognizing the symptoms as probably due to ulcer, had the child undergo a thorough x-ray examination which revealed the presence of a definite duodenal niche.

A more recent patient, an eight-year-old boy, came to see us, with his mother, because of abdominal disturbance and constipation. A careful history and physical examination elicited definite epigastric tenderness, an anal fissure, sentinel pile and enlarged anal crypts. Because the patient was nervous he was given a modified Sippy diet and aluminum hydroxide tablets. The mother was instructed as to proper feeding and taking care of the bowels. A suppository containing 1 per cent Balsam of Peru, and Benzocaine was prescribed morning and evening after a hot sitz bath. Following the lapse of a week the child returned to the office. He was quite subdued and permitted a more thorough examination. Stool examina-

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tion after a meat-free diet was unnecessary because of the fissure-in-ano, which bled and would have confused the issue. Roentgen study revealed a tender and irregular duodenum; no definite niche was found at this time.

However, this patient is interesting from the clinical standpoint because diet and medication relieved the symptoms, and also because this patient may have had reflex duodenal irritation secondary to his rectal condition. This, however, requires further study. A history survey revealed this child's paternal grandmother and his father have ulcers of the duodenum of many years standing.

It has been estimated that ulcers occur at least six to eight times more frequently in males than in females. We do not fully agree with this statement, because during the war years many more ulcers were encountered in both sexes than in previous years. Females became more neurotic and emotionally unstable under the influences of war conditions, with an increase in the tendency to ulcer development, thus undoubtedly causing a statistical increase in this group.

Dietary fads may be contributing factors in the increased incidence of ulcers in the younger females.

OCCUPATION

In many patients, occupation may be an etiological factor. Special reference is made to cooks, shoemakers, also to physicians and dentists. In the latter two, constant anxiety, strain and irregularity of meals are the factors believed to be responsible.

World War II has been instrumental in bringing on ulcers, hemorrhages and perforations both in civilians and in members of the armed forces. We have come across many patients who manifested no symptoms previous to their induction, but due to the stress of circumstances developed fullblown ulcer syndromes.

From experiences gained by one of us (J. W.) during the immediate post-war period, on the gastrointestinal service of a large Army General Hospital in the South, at which veterans were also being treated, it was noted that the strain of readjustment also took its toll. Many of the soldiers, who during the war did not mind being overseas and in combat, resented being kept in the Army of Occupation, or, if they were to be discharged, began worrying about how they would fit into the life pattern of their home town after a lapse of 3 or 4 years.

This, combined with a relaxation of the "fraternizing rule" which resulted in an increase in drinking and eating of native foods, caused an increase in the production of ulcers. A majority of cases treated seemed to come from Japan and Alaska, where they received superficial treatment with temporary relief. This treatment, however, was for the most part suspended while they were being transhipped to the continental United States. When the convoys of patients arrived at the Army General Hospital, the ulcer patients were in worse shape than when they began their journey; intensive and active treatment had to be instituted immediately.

The veterans who came under observation were, for the most part, young men who had married during the war, and were not only trying to adjust them-

selves to a new home-life but were also trying to find ways and means of making a living. Their insecurity, uncertainty and irregularity of eating habits helped to produce a new crop of ulcer patients from an age group that formerly had a low statistical incidence.

GEOGRAPHICAL DISTRIBUTION

The occurrence of peptic ulcer in various sections of the world has interested physicians, and therefore the geographic distribution has been extremely instructive and suggestive as it gives the first indication that food may play a very decisive role as an etiological factor.

Denmark shows a higher percentage of ulcers than Switzerland. They are more common in Great Britain than in the United States. South China, the Gold Coast and certain parts of Brazil have less ulcer patients, while in Japan and the Himalayan section of India, indications are that ulcers are practically unknown. The other natives of India, who, to a great extent are vegetarians living mostly on rice, wheat and cereals, are as a rule also immune to ulcers. Chronic ulcers are not found in the inhabitants of the Rhone Valley, the Bavarian Alps, Siam, and French Morocco. Ulcers are unknown among primitive people, until they come in contact with civilization.

According to latest statistics it is estimated that 5 to 12 per cent of the population of the United States will develop ulcer during their lifetime. To us this estimate is rather low.

CAUSATION OF ULCER

Numerous theories have been promulgated regarding the cause of peptic ulcer, but a survey of the recent literature dealing with the ulcer problem indicates that no one agent has definitely been proven to be responsible.

Among some of the theories one finds the vascular theory of Virchow, who suggested the cause to be some disturbance of local circulation. This theory is still accepted by some investigators. In rare cases where the arteries of the mucosa have been sclerosed and where they are a part of a general state of atheroma, the explanation is a simple one.

Vagotonic and neurogenic conditions as mentioned by Eppinger and Hess, Von Bergmann and other physiologists and clinicians, may be factors in the formation of peptic ulcer and concomitant secretory and muscular disturbance as a result of some disharmony in the vegetative and glandular systems.

Brain lesions according to Cushing, may have a direct bearing upon ulcer formation. This close relationship between the nervous and glandular systems and the gastrointestinal tract is not a new theory. The effect of nervous influences upon gastric secretions has been regarded by various investigators as a basic etiological factor of ulcer, especially of ulcer of the stomach proper.

Electroencephalographic studies advanced our knowledge of the possible role played by the brain in the causation of ulcer. A high alpha index is associated with a passive, dependent, receptive attitude toward other persons, provided this

attitude is freely accepted and not thwarted or inhibited internally. In the peptic ulcer group, as previously mentioned, there is a definite relationship between a high alpha index showing three and one-half times as many alpha records in this group as in a normal group of 100 controls.

Anemia caused by spasm of the muscularis through reflex action, produces ischemia through obliteration of the arterioles. Necrosis and erosions occur, and are aggravated by hyperchlorhydria which is usually present in vagotonic subjects.

Experimental production of trophic ulcers has been caused by interference in various ways with the nerve supply of the stomach. Removal of both adrenals in animals has caused the formation of ulcer. Additional experiments showed that ulcers may form in animals fed exclusively on autoclaved food, and may probably be ascribed to lack of vitamins. Excessive carbohydrate food, gastro- and enterotoxins (emulsion of gastric cells) and a variety of drugs (pilocarpine, atropine, chloroform, copper sulfate, cinchophen, and others) as well as x-ray irradiation, may also produce ulcers. Ultramarine blue in fine suspension (confirming the experiment with lead chromate) has also produced ulcers with resultant hemorrhagic infarction whenever the tissues were injected. When the animals did not die from the localized ulcer and gangrene, the ulceration tended to heal. A chronic simple ulcer similar to that in man has never been reproduced. Erosions and ulcerations occurred in dogs fed with gruel at a temperature of 50° C.; the ulceration not being due to scalding, but to congestion with increased peristalsis.

Constitutional factors and diathesis as promulgated by Hurst and Draper are not considered today in the same light as years ago. Considerable stress had been laid upon the skeletal build of the individual—the so-called *habitus enteropticus*. In this particular habitus there is a much longer line than normal between the ensiform and umbilicus in contrast to one drawn transversely to the mid-axillary line. These individuals have a lower and flatter than normal diaphragm, increased depth of the dorsolumbar curve and inversion of the normal pear-shaped fundus of the peritoneal cavity. They also frequently have octagon wrinkles about the mouth, a highly arched palate and an exceedingly long neck. Conversely, the nonstriated muscular system is functionally weak. These individuals tire easily and must rest often. An examination of many patients with this peculiar habitus shows them to have symptoms which mimic a gastric or duodenal ulcer, but careful examination does not reveal a gastric or duodenal lesion.

Hurst further stated that there is an inborn hyperathenic diathesis and constitutional tendency to hyperchlorhydria, and so to ulcer formation. He further stated that he had seen families in which two or more brothers and sisters of an ulcer patient had symptoms simulating peptic ulcer. Other observers, including the essayist, have had similar instances in which one or more members of a family—father, mother, brother, son or daughter—had an ulcer.

Focal infection as an etiological factor, especially pyorrhea alveolaris, chronic infection of the tonsils, of the accessory sinuses, the gallbladder, the appendix, the intestines, at times the prostate and uremic states, have in turn

been held responsible. Focal infection may make the membrane more vulnerable and in our judgment, foci of infection are responsible for a great number of ulcers. A septic focus or an endarteritis can easily reduce the resistance of the mucous membrane of the stomach or duodenum, with resulting infection, ischemia, etc., and thus cause ulcer. It has been our experience that many ulcers having been treated medically or surgically often fail to respond, due to the primary focus not being eradicated. In other cases, we noted that although the primary focus had been removed, other organs—the appendix, gallbladder and the colon—had been infected from the primary focus, thus becoming a secondary focus, subsequently causing a continuation of the ulcer process.

Rosenow experimented on animals in which he produced acute ulcers by injecting streptococci intravenously, and claimed some selective affinity of his strains for the gastric mucosa (elective localization). Other investigators produced gastric ulcer after injecting staphylococci into the peritoneum of a guinea pig, having first distended the stomach by injections of a solution of bicarbonate of soda.

In spite of these experiments we are still unconvinced—even though anhemolytic streptococci are present in practically all gastric ulcers—that this organism has been proven to be the factor which either initiates the ulceration or prevents its healing.

There are many advocates supporting the belief that acid-pepsin is an etiological factor in the production of peptic ulcers. This has not been accepted universally although recent evidence has been presented to support this thought.

Another theory to join the ranks is that of lysozyme being the etiological factor. There has not been sufficient positive evidence submitted to support this claim.

PSYCHOSOMATIC THEORIES

The question of psychosomatic disturbances in ulcer patients is receiving more and more prominence. As previously mentioned, emotion must not be overlooked as a possible etiological factor. The physician must consider whether the emotional or psychic states of a patient may act as a causative or simply a contributory agent. Anxiety, stress, frustration, guilt-feeling, hostility and resentment may cause hypersecretion and hypermotility of the stomach.

In certain patients, emotional states induce gastric hyperactivity and hypersecretion. Further studies have shown that stimulation of gastric activity as a result of an emotional state is believed to follow the vagal pathway since the vagal nerves are completely responsible for the cephalic phase of gastric secretion and are essential in controlling gastric motility or force. Anger stimulates the production of a large volume of hydrochloric acid.

Bilateral vagus resection does not always yield the results expected. By cutting the nerves, the stomach is no longer affected by extraneous factors and the amount of acid secreted, plus contractions of the stomach, are lessened. However, after the operation, the stomach becomes sluggish and has a tendency to distend

like a balloon. When the ulcer crater is located in the stomach, the operation is not always recommended. Not only does the stomach lose its tone, but the intestines are also influenced and some patients complain of diarrhea and cramps. Many other patients have had relief after vagotomy or vagectomy, therefore, each case must be treated individually.

SYMPTOMS

Both gastric and duodenal ulcers are characterized by paroxysms of pain which may vary according to the type of patient, that is whether the patient is a hypo- or hypersensitive type of individual. It may be dull, aching, burning but not lancinating. It may be mistaken for indigestion. In gastric ulcer the pain is usually noticed shortly after meals since the food eaten protects the lesion from the gastric juices for a short time. As the stomach empties itself, the ulcer is again exposed to the action of the gastric juice. A patient with a duodenal ulcer does not have pain for several hours after eating. Certain types of food, such as albuminous materials and those with great acid combining properties relieve the pain more so than those foods which do not possess this property.

As a rule the pain is difficult to localize. The right rectus muscle may be more or less rigid. The peritoneum may be involved if there is marked local tenderness and rigidity, and if there is pain which radiates to the back, the pancreas may be involved. In gastric ulcer, tenderness may be noted to the left of the 10th and 12th dorsal vertebrae, whereas in duodenal ulcer it may be to the right. Frequently the ulcer penetrates and becomes adherent to the other viscera.

Not all ulcers penetrate, nor do they present typical symptoms. Many patients first learn that they have an ulcer during a routine check-up examination for some vague abdominal complaint and are surprised to hear that the x-ray revealed a gastric or duodenal lesion. Many others are suddenly seized with dizziness, weakness, accompanied by melena or hematemesis. Some of these patients have had little or no epigastric distress, although at times they experienced fullness after meals, flatulence, pyrosis, indigestion and other vague abdominal symptoms.

Penetration of an ulcer may occur in at least one in four surgically verified ulcers. As a rule these lesions are usually posterior and involve some neighboring organ such as the pancreas and the liver, less frequently the gallbladder and the colon. A localized abscess in the lesser peritoneum with involvement of the omentum may occur. In these cases, the pain becomes more severe. If the usual mode of obtaining relief is less effectual, the pain-food-ease sequence is less distinctive, and especially if the originally localized pain extends toward the region of the liver, posteriorly, or upward into the chest, or in the case of a jejunal ulcer, downward toward the pelvis, the presence of a deep penetrating or perforating ulcer should be seriously considered.

When the pain becomes continuous, is no longer relieved by food or antacids, and increases after eating; loss of appetite and loss of weight are predominating symptoms; the question of malignancy should be carefully ruled out.

Malignant changes in gastric ulcer reach a high percentage—15-20 per cent. Besides gastric analysis, x-ray studies, gastrophotography and gastroscopy should be continually employed. Other symptoms may be constipation, occasionally diarrhea, hemorrhage, anemia and general debility from dieting.

These patients should be urged to undergo exploratory operation, even though the findings are not typical of malignancy.

Therapy

Many new therapeutic approaches to the peptic ulcer problem were tried and reported in the past few years. Among therapeutic agents which received wide acclaim were protein hydrolysate preparations, which, although having nutritional value, did not of themselves prove to be the panacea as predicted.

Great therapeutic virtues were claimed for such agents as enterogastrone, (essentially an extract of the upper intestinal mucosa) urogastrone and anthelone (extracted from urine), but as in the case of the hydrolysates, the therapeutic results have thus far proved to be disappointing.

As previously mentioned, the treatment of ulcer depends upon the mental and psychic state of the patient. In undertaking to treat a patient who manifests clinical symptoms of ulcer, the physician must obtain the whole-hearted cooperation not only of the patient but of the family. It is important that worry, excitement, jealousy, etc., must be overcome before complete relief is obtained.

Physical and emotional states tend to aggravate the condition; therefore, all disturbing factors such as fatigue, lack of rest and sleep are barriers to improvement. Alcohol, condiments, excessive smoking, roughage, cold and hot foods or drink should be eliminated. The patient's meals should be well spaced and he should take rest periods, vacations and even consider change of environment.

Various sedatives and antispasmodics are useful adjuvants in the therapy. In selecting a diet it is important that the patient's likes and dislikes be considered. Milk, which is the usual standby, cannot be taken by some patients because of an idiosyncrasy or allergy. Supplementing the diet with various protein hydrolysate preparations, when tolerated, increases the nutritional state and thus hastens the healing of the lesion. Ascorbic acid is a valuable addition in the therapy of ulcer.

Shall we use the Sippy regime or its modifications? A great deal depends upon the physician in prescribing the appropriate diet and the agreement of the diet with the patient. On our service at the New York Polyclinic Medical School and Hospital, we use various modifications and have omitted the alkaline powders thus eliminating the tendency to alkalosis. Clinic patients as well as those hospitalized are given a fairly liberal diet unless special contraindications, such as nausea, vomiting, diarrhea, allergy are present. In these cases, a suitable diet is selected and carefully supervised.

As a reminder, we shall briefly mention Dr. Sippy's treatment which consisted of a mixture of equal parts of milk and cream given every hour on the hour and

an antacid powder every hour on the half hour. Powder number 1 consists of 10 grains each of magnesium oxide and sodium bicarbonate and was given alternately with powder number 2 consisting of calcium carbonate or bismuth subcarbonate and bicarbonate of soda each 10 grains.

He further advocated emptying the stomach through a stomach tube at 9 o'clock at night, and leaving one or two powders with the patient for the night. Should diarrhea occur, he advocated omitting powder number 1 for the time.

When nausea, vomiting or intolerance of this diet occurred, rectal feeding was substituted. Transduodenal alimentation for a week or more found many adherents amongst the older gastroenterologists. We remember when Drs. Moritz Gross and Max Einhorn demonstrated and extolled duodenal feedings as useful adjuvants. In giving protein hydrolysate preparations through the duodenal tube the patient does not object to the taste and thus continues his feedings.

In our discussion of the ulcer problem, we would like to call attention to *hemorrhage* from the stomach or duodenum which today is treated entirely differently than in former years. It was customary to starve the patient for 24 to 48 hours and then begin with the Sippy regimen. Today, unless there is continued emesis, the patient is placed upon the Meulengracht diet in order that he may regain his strength in the shortest possible time. Medication is given in the form of anion exchange resin, iron, protein hydrolysate preparations, according to requirements in each individual case. The use of the duodenal tube for feeding or for lavaging blood clots from the stomach is no longer a contraindication unless cardiovascular conditions are taken into consideration.

Often the question arises whether or not a patient needs transfusion and how much and how often. There are no hard and fast rules. On our service, transfusions are given when the hemoglobin is in the low forties and the red cells are around two million plus.

Air-hunger, weak, rapid pulse and shock are indications for transfusion. Small quantities of plasma, 200 to 300 cc. given slowly and repeated according to indications are often better tolerated than 500 or 1,000 cc. Large quantities tend to increase blood pressure and thus may increase bleeding, especially in older people or in cases of arteriosclerosis. Feeding, when tolerated, is the best means of overcoming the anemia.

Azotemia (increased urea elevation) is an important factor in determining when to transfuse or not to transfuse. Where the hemoglobin and red cells are low, transfusion may be of benefit in increasing renal circulation and thus decreasing the azotemia.

Whether to use fresh whole blood or "bank blood" depends on many factors, particularly on the possibility of obtaining the matching donor.

Multiple transfusions have been given to patients when other treatments failed, and we are happy to state that with careful technic and slow flow, no untoward effects were noted.

The physician is frequently confronted with the problem of complete or partial obstruction of the stomach. The x-ray shows a definite obstruction at the pylorus, due either to an edema or cicatricial condition, in the pyloric canal or in the duodenum. Should surgery or medical treatment be tried to overcome the obstruction? This is a delicate and controversial problem which the surgeon and the gastroenterologist have to solve together.

Our suggestion to the patient is that by all means medical treatment is indicated for a length of time; failure to obtain relief necessitates operation. The selection of patients most likely to be benefited by conservative therapy depends upon the amount of residue after 6, 8, 12 and 24 hours. If within this given time most of the barium meal has left the stomach and has entered the colon, we advise that, by all means, the patient be given a fair chance. It is also advocated in patients with cardiovascular lesions where operation is a hazard.

Before therapy is begun, the patient's blood chemistry, blood count, stool and other pertinent tests are done. Special consideration is given to the presence of increased blood sugar and chlorides.

The patient and his relatives or friends are made cognizant of all the facts and they are given to understand that if relief is not obtained in 10 to 14 days, surgery is to be invoked.

Most of these patients are dehydrated, anemic and undernourished, therefore, it is my aim to combat these factors at the earliest possible moment by emptying the stomach of its stagnant contents either through a size sixteen duodenal tube passed through the nose or with a regular stomach tube, lavaging with tepid water or normal saline solution. In some patients, we use peroxide of hydrogen $\frac{1}{2}$ ounce or more, to a pint of warm water, which flushes out mucus and debris from between the hypertrophied rugae of the stomach.

When the return flow comes back clean, the patient is put to bed and intravenous glucose in Ringer's solution is started. Usually a 5 per cent glucose in 1,000 cc. of Ringer's is given, being careful that it does not flow too rapidly especially at the beginning. Preferably 35 to 40 drops per minute will prevent shock and chills. In conjunction with the intravenous solution, 100 mg. Vitamin B₁ and 100 or 200 mg. Vitamin C are introduced. Liver and iron by hypodermic, also grain 1/200 to grain 1/100 of atropine sulfate (unless contraindicated) are useful adjuvants to the daily treatment.

The patient is admonished that he must relax, rest and stop worrying and fussing.

When the patient has had his intravenous, he is ready to have the duodenal tube inserted into his stomach. We prefer to use our own duodenal tube which has a small metal pellet imbedded in its tip, has large fenestration and is opaque to the x-rays. The tube is passed through the nose, having first anesthetized the mucous membrane with one per cent larocaine or 2 per cent pontocaine. It is also advantageous to apply the anesthetizing solution to the posterior pharynx so that gagging will be eliminated. Fluoroscopic control of the tube is essential so

that the physician can see whether or not the tube reaches the pylorus or is curled on itself and interferes with the aspiration of the food residue and secretion.

It is advisable before each feeding to aspirate and note the amount of material removed. Feedings are given at one or two hour intervals. For the first 24 hours peptonized milk or the protolysate mixture may be used. Later, regular formula for duodenal feeding may be used, if the patient retains it well. (Protolysate, 122 gm.; nutramigen, 340 gm.; sugar, 242 gm. and water ad 3 liters.)

With each feeding or one-half hour later, one to two grams Resinat powder* is given either orally or through the tube. The nurse is instructed to clamp the tube for about 30 minutes after each feeding, then it is unclamped and lowered so that the stomach may drain through the tube until the next feeding.

Intravenous glucose, vitamins, iron and liver are continued. If after three or more days, there is definite improvement in the patient's condition and the return aspiration becomes less or is entirely absent, the tube may be removed and the patient permitted to use the protolysate or orange juice-gelatin mixture for 24 hours or longer and then gradually go on a modified Sippy or convalescent ulcer diet.

As a supplement to the patient's diet, protein hydrolysate (Aminonat)* preparation or an intact protein preparation (Protinal)* may be prescribed in order to make available necessary essential amino acids. In conjunction with this, Resinat should be given in one-half to one gram doses at one or two hour intervals.

POSSIBLE CAUSES OF RECURRENCES

For a time, a patient may respond to diet and to one or the other of the antacids, or their combinations, then suddenly neither diet nor the medicines previously used give relief. In these cases the physician must seek for some mental, emotional, domestic or financial upset and in addition to diet and medical therapy, psychotherapy may aid in alleviating the symptoms.

Often a simple ulcer becomes aggravated and inflamed or penetrates into the pancreas or other viscera, and here again neither psychotherapy, diet nor medication will relieve the patient completely of his symptoms. He goes from one physician to another only to find that relief is not forthcoming. Gastrophotography and gastroscopy, in addition to fluoroscopy and x-ray, will reveal the true state of affairs. Surgery often will be the only alternative.

When the patient refuses to submit to surgery he should be told that only now and then may he expect temporary relief or none at all. If the ulcer is on the lesser curvature, antrum or pylorus, either the patient or a member of the family should be told of the possibility of malignant degeneration, pancreatitis, diabetes, etc.

Still another cause for recurrence of ulcer symptoms or lack of relief may be due to the patient's inveterate smoking, eating and drinking habits. Over a period of more than two years, a group of patients, male and female, (96 in number) have been carefully studied as to their smoking habits and various tests carried

*Resinat, Aminonat and Protinal are products of The National Drug Company, Philadelphia, Pa.

out to determine the effect on digestion, acidity, secretion of mucus.* We found that smoking immediately, or within 15 to 30 minutes after eating, did not materially increase the hydrochloric or total acid. In a number of patients (25) the mucus secretion was increased which undoubtedly lowered the acid. These tests were carried out in patients on a fasting stomach, after an Ewald meal, after 7 per cent alcohol, neutral red, 1:1000 histamine and a 1 per cent pepsin injection.

Patients who persisted in smoking three-quarters or one hour after meals, or chain smokers, who smoked before breakfast and at night, were not relieved from their heartburn or ulcer symptoms.

Other complications which continue to give ulcer symptoms may be concomitant gallbladder inflammation, diabetes, nephritis, chronic appendicular involvement, viscerotaxis, nephrotosis and constipation.

SUMMARY

1. Peptic ulcer may occur in any age group; infants, children, middle-aged and elderly people. It has been estimated that this disease occurs 6 to 8 times more frequently in males than females. However, recent statistics tend to change this ratio, there being an apparent increase in the younger female group, due undoubtedly to the recent war conditions and present stress of readjustment.

2. A review of the geographical distribution of the ulcer problem shows it to be more prevalent in Great Britain than the United States. It is estimated that 5 to 12 per cent of the United States population, a conservative estimate, will develop ulcer during their lifetime.

3. The various theories of ulcer etiology are reviewed. It is suggested that focal infection may play a prominent role as an etiological factor in either initiating ulceration or preventing healing. Consideration of psychosomatic factors as causative or contributory agents is of considerable importance in the management of ulcer patients.

4. Symptomatology of ulcers is discussed in detail.

5. Several ulcer therapies are reviewed with special reference to Sippy treatment and diet.

6. The problem of hemorrhage from the stomach or duodenum is given detailed consideration from the standpoint of proper medical management; suggesting the use of an anion exchange resin as an antacid.

7. Some of the possible causes of recurrences of ulcer and the management of these recurrent ulcers are presented.

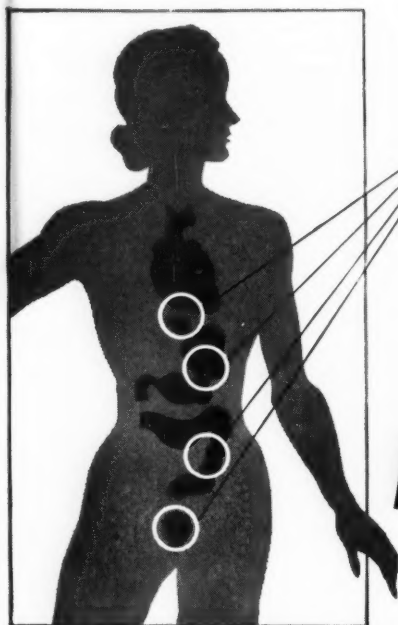
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SPASM

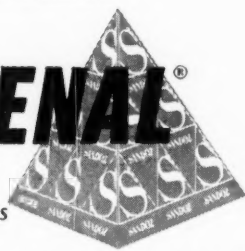
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CLINICAL OBSERVATIONS ON THE BEHAVIOR OF FOREIGN BODIES IN THE STOMACH*

EDDY D. PALMER, MAJOR, M.C.

Intragastric foreign bodies are conveniently categorized in this way:

1. Insensibly ingested insoluble particulate material which becomes embedded in the mucosa, with subsequent foreign body granuloma formation. The pathologic process in the stomach has been likened to that of pneumoconiosis in the lungs¹ and the term "gastroconiosis" (kóvis—dust) might be applicable here. Medicinal kaolin², silica^{1,3} and metallic dust⁴ have been found to be etiologically important.

2. Precipitated resin masses which may form in the stomachs of certain alcoholics following ingestion of shellac and other resinous products. Here might be included the rare case of contrast-medium concretion which develops following roentgenologic examination of the stomach.

3. The bezoars.

4. Silk sutures hanging within the gastric lumen after gastric surgery.

5. Retained undissolved medicinal tablets, which may lie free in the stomach for many months, particularly when there is hypochlorhydria or achlorhydria. Calcium, bismuth, magnesium and sodium carbonates may be offenders^{5,6}.

6. Accidentally ingested macroscopic foreign bodies, such as meat bones, toothpicks, dentures, chewing gum, toy whistles, pins, and needles.

7. Purposefully ingested macroscopic foreign bodies. Three types of patient fall into this group, the psychotic, the vocational foreign body swallower of the circus side-show, and the convicted criminal who attempts to escape incarceration and hard labor by forcing hospitalization and, perhaps, operation.

The type and degree of gastric mucosal damage produced by a foreign body are influenced by the length of the period of retention, the chemical nature of the object, and its configuration. Of these factors, the period of contact with the gastric mucosa is the most significant. The influences of the other two factors must, of course, depend to some extent on the period of retention. The gastric mucosa has a remarkable tolerance to certain strong foreign chemical substances, much more so than has the skin of the forearm, as Wolf and Wolff⁷ have demonstrated. When mild—although necessarily concentrated—solid chemical substances remain long in contact with the mucosa, however, notable damage may result. Thus, in a patient who had harbored four magnesium carbonate tablets in his stomach for more than six months, Patterson and Rouse⁵ found gastroscopically that the mucosa "failed to show the normal rugae, being edematous, mottled and having

*From the Medical Service, 98th General Hospital, APO 407, European Command.

somewhat an infiltrated appearance . . . (and) a large red (acute) ulceration". A patient who had retained at least 22 tablets of calcium carbonate during a modified Sippy regimen for gastric ulcer showed "a uniform hyperemia and granular leathery appearance of the mucosa, with absence of normal highlights".

The study of stomachs which contain bezoars can give valid information on the effect of mere long retention of a foreign body, because bezoars lie and grow in the stomach for many months or years, and because chemically and mechanically they are the least irritating of foreign bodies. Unfortunately, when there is an attempt to evaluate observations here, it is often impossible to judge the age of the bezoar. As a result of surgical experience, it is known that the masses may become adherent to and even embedded⁸ in the mucosa, at times requiring "some force to dislodge this foreign body"⁹. Because observations of the mucosa at the time of operation are entirely unsatisfactory and because resection of stomach tissue has rarely been found necessary in treating cases of bezoar, direct evidence of local changes must spring largely from gastroscopic observations, and this method has been found entirely satisfactory in the few cases studied. Of the three patients reported by Patterson and Rouse (l. c.), mucosal damage was found in one: "Around the margins (of a large phytobezoar) were small superficial erosions." In Mitchell's⁸ case, the area about a multiple phytobezoar showed a mucosa that was "very red and edematous . . . The gastritic changes passed on toward the cardiac portion of the stomach". Less direct evidence of mucosal injury produced by bezoars has been presented by others. Thus, it has been pointed out that hematemesis may be a manifestation of the disease¹⁰. A rather frequent association with acute gastric ulcers has been found¹¹⁻¹⁴. When long retained within the stomach, of course, large metallic foreign bodies, such as table knives and forks, may likewise be responsible for traumatic ulceration and perforation of the gastric wall. It is a matter of some interest that phytobezoars develop in the normal and hyperacid stomach, while medicated tablets remain undissolved only in the anacid stomach; the latter more frequently than the former might be coincidentally associated with gastric cancer. No causal association between retained foreign body and carcinoma of the human stomach has been demonstrated. That a foreign body reaction within the stomach may lead to true tumor formation is, of course, known in the case of murine nematode infection with *Spiroptera neoplastica*.

The magnitude of mucosal change which may result from long-continued irritation by seemingly insignificant foreign material is well demonstrated by the stomach harboring partially loosened suture material:

Case 1:—A 32-year old white physician had had a subtotal gastrectomy for proven duodenal ulcer at the age of 28. The ulcer had been removed. After a year of good health, ulcer-type symptoms had returned and had been persistent, although not incapacitating, until the time of study. X-ray examination showed a normal but rather atonic post-resection stomach. At gastroscopy a loop of black

suture material was found protruding from the mucosa at the greater curvature aspect of the stoma, presumably close to the line of anastomosis. It was estimated that the exposed thread was 1.5 cm. long, and it could be seen that there was slack in the loop. Lying almost between the ends of the exposed suture but slightly proximal to it, there was a ragged circular ulcer about one cm. in diameter. A portion was obscured by yellow-pink mucus, which was also scattered in patches over the surrounding mucosa. The peripheral mucosa, including the regions where the suture disappeared into it, was intensely hyperemic and mildly edematous. The floor of the crater was depressed perhaps three mm. below the uneven rolled edge. There was no bleeding, nodularity or apparent infiltration. Except for the mucous exudate, the reaction was limited to the immediate region of the suture. There was no generalized gastritic process. No stomal rhythmicity was observed.

After one month of strict medical treatment in the hospital, including three weeks of bed rest, there was no improvement either in the symptoms or the gastroscopic picture. No evidence of ulcer-healing or regression of the local gastritis was found. Surgery was then resorted to; the anastomosis was partially taken down, a small wedge resection of the greater curvature done, and the anastomosis reestablished. The specimen revealed a rather deep ulcer straddled by the suture. The latter pulled free with a very small amount of traction. Histologically the ulcer was benign.

The patient was followed for two months. Following the immediate post-operative period, he had no further symptoms referable to the gastrointestinal tract.

Microscopic evidence of nonabsorbable suture material may persist in the gastric wall for as long as 15 years following operation, but it is probable that most sutures are lost into the lumen of the bowel during the first few postoperative weeks¹⁵. When sutures are placed so as to include the mucosa or when they work partially out into the lumen of the stomach, they may hang free as loops or loose ends and thereby come into contact with the neighboring mucosa. The consequent irritation may produce several degrees of local damage. Occasionally at gastroscopy a thick black thread is seen emerging from normal appearing mucosa, with no evidence of reaction other than a local excess of clear mucus. At times intense hyperemia, edema and erosions are found about a free suture. Such a traumatic gastritis is regularly limited to an area which is within reach of the suture, so that there can be little question of its etiology. Rather frequently¹⁶ in cases of post-operative distress a chronic ulcer is found in the immediate vicinity of a protruding suture. There can be no doubt that such an ulcer has been the result of constant foreign body irritation, and Schindler^{17, 18} has emphasized that the ulcer cannot be expected to heal while the suture remains in place.

Quick direct traumatic injury inflicted by sharp objects constitutes another aspect for consideration. The mechanical actions of the muscularis mucosae and muscularis propria in the presence of sharp-pointed foreign bodies are believed to be complicated, and are directed, almost as if teleologically, toward protection

of the gastrointestinal wall. Although, of course, sharp-pointed objects are unquestionably potential hazards and at times are forced quickly through the bowel wall by peristaltic activity, such a course of events is rare. It is rarest in the stomach, and most likely in the region of the second portion of the duodenum, the duodenojejunal junction, and the terminal ileum. Best¹⁹, who has outlined briefly some of the factors believed to be important in the autoprotective action of the gastrointestinal wall, emphasized the effectiveness of the "trigger reaction", which, by leading to localized contractions, causes a rejection of the stimulating object upon contact with the mucosa, provided there is no resistance at the other end of the object to prevent its backward movement. Indirect supporting evidence for this theory is found in the observation that sharp-pointed objects show some tendency to traverse the gastrointestinal tract more slowly than do rounded objects. Best (l. c.) found that ordinary sewing needles, with two sharp ends, travelled more slowly than a single-pointed nail, which, in turn, was retained longer than a closed safety pin. It is probable, however, that a general rule in this situation would be found valid in only a small proportion of cases, and Best's experience may be considered rather unique. The problem arises as to how foreign a foreign material must be before the mucosa will recognize it as such.

In any case, it is well known that, although a sharp object may remain innocuous for long periods in the stomach, travel should be rather continuous after it has passed the pylorus. There is reason for considerable concern should it remain stationary for more than 24 hours in the small bowel. Penetration or perforation must then be considered likely, irrespective of the patient's clinical picture.

The influence exerted by the mere length of a foreign body upon the rate of its propulsion out of the stomach and through the intestines is not well understood. The vagaries of physiologic gastrointestinal muscular activity in this regard are well illustrated by the following three cases.

Case 2:—A 36-year old Negro male was hospitalized with the diagnosis of gastric ulcer. While undergoing initial study, the patient was placed on an ulcer regimen, which included an antacid powder enclosed in rather large gelatin capsules. One such capsule was taken every two hours during the day. Gastric analysis following histamine stimulation revealed no free acid, but the nocturnal gastric secretion obtained by constant suction contained 16 CU free acid. Because it was found that the treatment was confusing evaluation of the case, medications and special diet were discontinued.

Four and a half days after the last antacid capsule had been taken, a gastroscopic examination revealed that one of the capsules was still in the stomach. It rested on the antral mucosa distal to the posterior limb of the angulus. It was intact and the shell was clear, revealing the white powder within. There appeared to be softening, however, for one end was wrinkled. The mucosa in the region of the capsule was entirely normal. Two benign ulcers were observed on the posterior antral wall beyond the capsule. There was no infiltration and antral peri-

stalsis was active. Subtotal gastrectomy was done, and three benign antral ulcers were found.

Case 3:—This 26-year old white male, who was being studied because of a history of hemoptysis, accidentally swallowed a clinical thermometer (9.9 cm. long) while his temperature was being taken one midnight. Fluoroscopy immediately showed the object lying obliquely along the greater curvature of the stomach. He was gastroscoped nine hours later, and the stomach was found to be empty and entirely normal. Eleven hours following its ingestion, the thermometer was found lying in the distal ileum by x-ray, and at twelve and a half hours it was passed. During the entire period the patient had nothing to eat or drink.

Case 4:—A 12-year old white girl accidentally swallowed a bobby-pin 4.8 cm. long, which she had been holding between her teeth. Daily fluoroscopy for two weeks showed the object to be fixed in a vertical position against the greater curvature of the pars media. The patient remained asymptomatic, but the bobby-pin did not move. At gastroscopy it was seen that the pin was lying on the greater curvature of the pars media. Except for a local excess of mucus, there was no mucosal reaction, and there was no evidence of mucosal damage. For 11 more days fluoroscopy showed the pin to be in the same position, but on the thirteenth, or 27 days after it had been swallowed, it was passed.

Small metallic objects may remain in the stomach many days, as illustrated by the case above, and then one must suppose that spastic action of the muscularis mucosae, apart from that of the muscularis propria, has incarcerated the object between rugal folds. This is a matter of speculation, of course, but seems reasonable because other localized irritating processes are known to throw small areas of the gastric wall into spasm. Moutier^{20, 21} drew attention to the "formations cavitaires d'origine dynamique", which are spastic pockets produced by muscle irritation about gastric ulcers. Such pockets may appear as large ulcer craters upon roentgenologic examination, but at gastroscopy it is found that they are formed of normal mucosa, while in their depths there are rather small irritating foci—in Moutier's cases, ulcers.

The larger foreign bodies also tend to linger in the stomach, whether or not their size mechanically precludes eventual passage through the pylorus. The important factor here is probably weight rather than dimension, the matter resolving itself into the ability of the stomach to grasp the object, raise it, and propel it through the pylorus. If this is so, the position of the patient's body must play a large part in determining eventual passage; experience with the duodenal tube leads one to suppose this is true. The custom of encouraging a bulky diet to facilitate the travel of foreign bodies is physiologically reasonable because food-stimulated gastrointestinal activities are more coordinate and purposeful than hunger contractions. It is to be noted, however, that in Case 3 an object as long as a clinical thermometer, swallowed into an empty stomach, was passed in only twelve and a half hours without the help of food or drink.

Case 5:—This 20-year old white male, who had a long criminal record, was sentenced to 30 months of hard labor by a military court. The past medical history was inconsequential except for scarlet fever complicated by hematemesis at the age of seven.

One week following incarceration the patient purposefully swallowed his dog-tags (each 5.1 x 2.8 cm.) with attached metal chain (Fig. 1). Later in the day he swallowed two can-opening keys (3.9 x 2.5 x 0.3 cm.). He was hospitalized and, two hours after the latter objects were ingested, roentgenologic examination showed one of the keys lying in the distal esophagus. The patient felt well, and abdominal examination was normal. On the first day* all foreign bodies were found in the stomach. The keys were passed together in one stool on the second day, but the dog-tags and chain remained in the stomach. On the fourth day they were found in the ileum by x-ray, and two days later they were passed. The patient, feeling well, was returned to constantly observed bare quarters in the stockade.

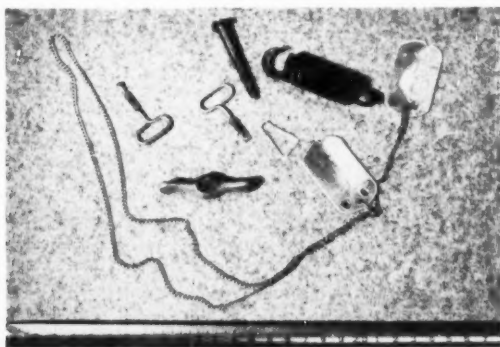


Fig. 1—The foreign bodies ingested by Case 5 in three lots over a 29 day period.

On the tenth day the patient swallowed a spring (7.4 x 1.8 x 1.8 cm.) detached from the frame and mattress-support of his standard type metal cot. He was again hospitalized, and during the next 10 days x-ray studies showed that the spring remained rather stationary on the greater curvature of the gastric pars media. It was passed from the rectum on the twenty-first day. The patient remained asymptomatic, and was returned to the stockade with a specially-assigned guard.

On the twenty-eighth day while in the latrine the patient removed and swallowed a wood screw 5.6 cm. long and the handle of a water faucet (5.5 x 1.4 x 1.5 cm.). The next day he broke a window and swallowed a piece of glass (2.6 x 1.4 cm.). He was hospitalized for a third time, feeling entirely well. Abdominal

*For clarity, reference to dates is indicated by the number of days following the initial ingestion of foreign bodies.

examination was normal. Roentgenologic examination on this day, the twenty-ninth, showed the two metallic objects in close apposition at the ileocecal valve. The next morning they, plus the piece of glass, were passed simultaneously, side-by-side.

Gastroscopic examination on the thirtieth day was entirely normal. The interior configuration of the stomach was normal. The antrum and pylorus were normal anatomically, but no peristalsis was observed over a period of several minutes. The mucosa was everywhere of normal color and intact, without hemorrhage, erosion, gastritic change, or other evidence of traumatic damage. There was, however, a "formation cavaire d'origine dynamique" of Moutier on the posterior wall of the proximal pars media, half-way between the curvatures.

Repeat gastroscopy two days later was again normal. At this time the area of muscularis mucosae irritability had cleared, and there was no evidence of explanatory localized mucosal damage. A gastrointestinal x-ray series was normal. The patient was discharged, asymptomatic, a third time to the stockade.

That similarly shaped and sized objects which have been swallowed one after the other may remain in apposition throughout their travels in the gastrointestinal tract is well demonstrated in this case. During one episode the two can-opening keys were passed in the same stool, and in another the faucet handle, wood screw and piece of glass were evacuated together. One cannot suppose that such coordinate movement is coincidence, nor can one necessarily assume that the precise shape or size of the foreign bodies has any specific control over it; rather, it appears that certain objects, finding themselves together in the stomach, are merely lifted together and carried along on the same series of physiologic movements until passage. Large variations in the size and weight of the objects influence the rate of forward travel by virtue of inertia and simple inability to fit through the bowel lumen.

CONCLUSIONS

Local disease produced by an intragastric foreign body depends almost entirely on the length of the period of retention. Although, for instance, several large metallic objects may pass serially through the stomach without producing demonstrable mucosal change, the loose end of a retained suture in the postoperative stomach may be responsible for chronic gastric ulcer.

Given the precise size, shape and composition of a swallowed foreign body, it is not possible to make a reliable estimation of the probable rate of passage from the stomach and through the intestines, or to judge the potential risk of local mucosal damage. Gastrointestinal propulsion appears to operate without special regard to the presence of a foreign body, and the rate of passage appears to be a matter of physiologic chance.

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CHAPTER ACTIVITIES

BOSTON CHAPTER

A meeting of the Boston Chapter will be held on Wednesday, 6 April 1949, at the U. S. Marine Hospital Auditorium in Boston, Mass.

The scientific portion of the program will consist of the presentation of "Unusual Gastroenterological, Medical and Surgical Cases" by the medical and surgical staffs, of the hospital.

NEW JERSEY CHAPTER

A meeting of the New Jersey Chapter was held on Monday evening, 21 March 1949 at the Jersey City Medical Center in Jersey City.

The speakers of the evening were Drs. Benjamin J. Macchia whose subject was "Reticulum Cell Sarcoma of the Stomach"; J. A. Riese who spoke on "Early (?) Diagnosis of Gastric Carcinoma"; E. J. Halligan who presented "A Rare Cause of Gastric Hemorrhage" and L. L. Perkel whose topic was "Pitfalls in Gastrointestinal Roentgen Diagnosis".

The next meeting of the Chapter will be held in conjunction with the New Jersey State Medical Society in Atlantic City on Monday, 25 April 1949.

SAN FRANCISCO CHAPTER

A meeting of the San Francisco Chapter of the National Gastroenterological Association was held in San Francisco, Calif. the first week in April.

NEWS NOTES

COURSE IN GASTROINTESTINAL SURGERY

The National Gastroenterological Association announces that a course in gastrointestinal surgery, jointly sponsored by the Association, the Postgraduate Division of Tufts Medical College and the Boston City Hospital, will be conducted by Dr. O. H. Wangenstein of Minneapolis, Minnesota, assisted by several speakers at the Fourteenth Annual Convention of the Association, and members of the staff of the Boston City Hospital.

The course will be given at the Boston City Hospital in Boston, Mass. on 27, 28, 29 October 1949, immediately following the 14th Annual Convention of the National Gastroenterological Association.

The fee for the course will be \$35.00 per person and registration will be limited to 250 physicians.

Further information concerning the course and applications for enrollment may be obtained by writing to the National Gastroenterological Association, 1819 Broadway, New York 23, N. Y.

HOTEL RESERVATIONS FOR THE FOURTEENTH ANNUAL CONVENTION

Included with the March 1949 issue of the Monthly Bulletin, sent to the members of the National Gastroenterological Association, are reservations cards for hotel accommodations at the Hotel Somerset in Boston, Mass. headquarters for our Fourteenth Annual Convention.

Members of the Association are urged to return these cards as soon as possible in order that they may be assured of accommodations. Non-members may obtain reservations by writing directly to the National Gastroenterological Association, 1819 Broadway, New York 23, N. Y.

Arrangements are being made with the hotel for those who will take the course in surgery, immediately following the Convention and who plan to stay over in Boston.

EXECUTIVE BOARD MEETING

A meeting of the Executive Board of the National Gastroenterological Association was held at the headquarters office in New York City on 7 March 1949.

Routine administrative correspondence was presented and properly disposed of.

The Secretary-General reported upon the meetings of the New York, Rhode Island, Boston and Los Angeles Chapters.

The following new members were elected to the National Gastroenterological Association: Dr. Newton C. Browder, Boston, Mass., Associate Fellow; Dr. A. J. Capone, Somerville, Mass., Associate Fellow; Dr. Robert Ehrlich, Boston, Mass., Member; Dr. Harold G. Goulston, New Bedford, Mass., Member; Dr. John J. Lorentz, Methuen, Mass., Member; Dr. John W. Spellman, Brookline, Mass., Associate Fellow; Dr. Richard H. Stanton, Boston, Mass., Member; Dr. Thomas W. Wickham, Boston, Mass., Associate Fellow; Dr. Nathaniel Edward Rossett, Memphis, Tenn., Fellow; Dr. Thomas H. Andrews, Long Branch, N. J., Member; Dr. Herbert Greenfield, Newark, N. J., Fellow; Dr. Leo Siegel, Newark, N. J., Member; Dr. Leonard Troost, Jersey City, N. J., Member; Dr. Bernard J. Ficarra, Brooklyn, N. Y., Fellow; Dr. Arnold Jacobsen, New York, N. Y., Associate Fellow; Dr. Bernard J. Schuman, New York, N. Y., Dr. C. A. Miller, Wilkes-Barre, Pa., Member; Dr. Jean Buckel, Montreal, Canada, Member; Dr. Alfredo D. Carrizo, Cienfuegos, Cuba, Member and Dr. Jesus V. Licad, New York, N. Y., Member.

Upon presentation of the necessary qualifications the following were advanced to Fellowship:

Dr. Donald S. Jurnove, New York, N. Y.; Dr. Michael Scimeca, Brooklyn, N. Y. and Dr. William Leet, Providence, R. I.

The various committees submitted their reports, which reports were accepted as presented and ordered filed.

The report of the Committee on Standards and Rating, consisting of a preliminary statistical report based upon the returned questionnaires on gastrointestinal clinics, was accepted by the Board and ordered to be published in *THE REVIEW OF GASTROENTEROLOGY*.

Matters pertaining to the Fourteenth Annual Convention in Boston, Mass. were discussed and action taken thereon.

It was voted that the National Gastroenterological Association become a sponsor organization of the testimonial dinner to be given to Dr. Bassler in New York City.

The President appointed a committee consisting of Dr. Benjamin M. Bernstein, Dr. Elihu Katz, Dr. Raymond J. Lutz and Dr. William C. Jacobson to cooperate with the dinner committee on behalf of the National Gastroenterological Association.

TESTIMONIAL DINNER TO DR. ANTHONY BASSLER

A testimonial dinner, to be given to Dr. Anthony Bassler, Honorary President of the National Gastroenterological Association, will be held at the Hotel Commodore in New York City on Sunday evening, 1 May 1949.

Dr. William B. Rawls, President of the Medical Society of the County of New York is Honorary Chairman, Dr. Elihu Katz, Treasurer of the National Gastroenterological Association, is the Chairman of the dinner committee.

Reservations for the dinner may be obtained by writing to Dr. Elihu Katz at 955½ Fifth Avenue, New York, N. Y. and tickets are \$15.00 per person.

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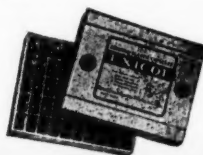
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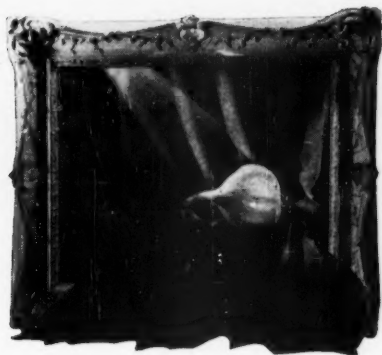
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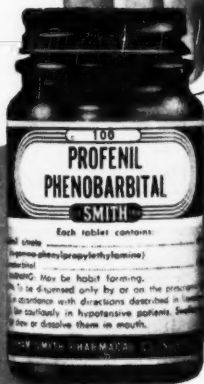
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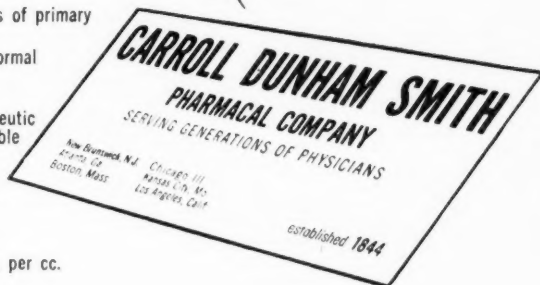
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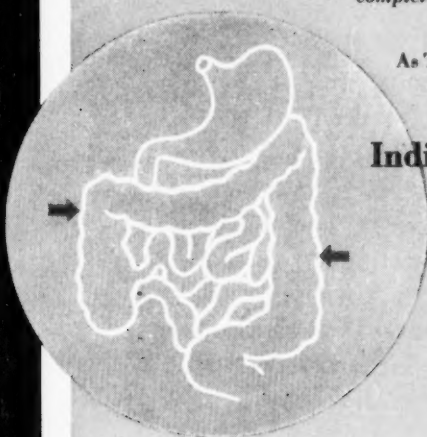
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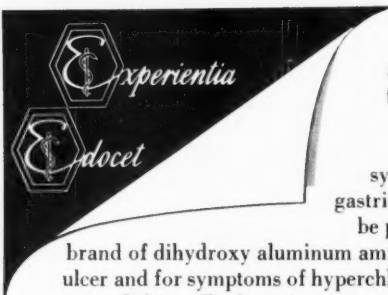
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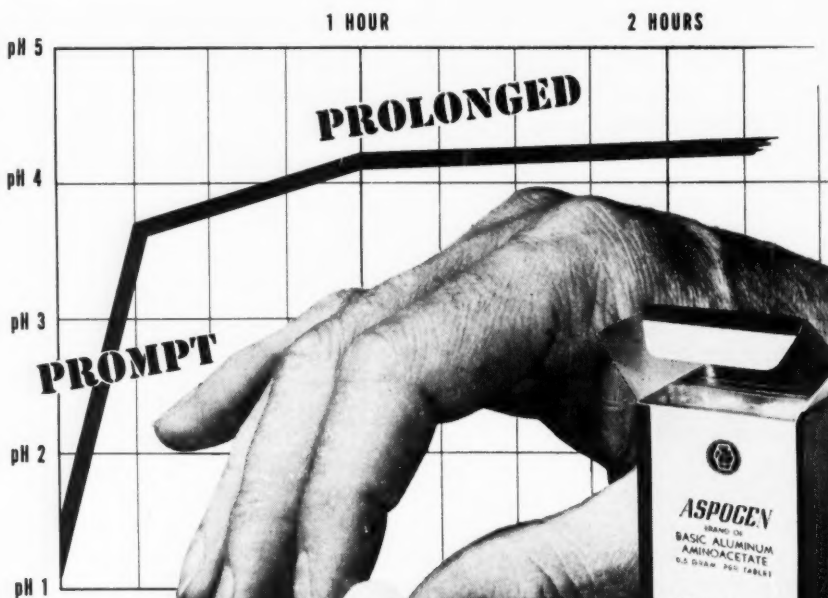


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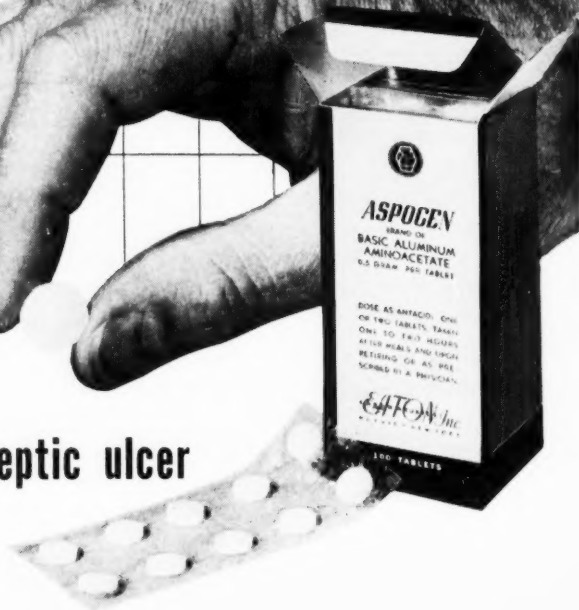
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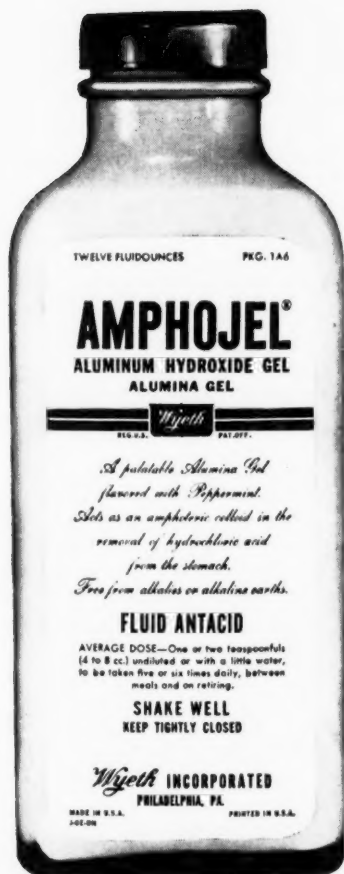
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